TEAC®

SERVICE MANUAL

C-1

Stereo Cassette Deck with Dolby System

GENERAL INTRODUCTION

This manual has been written to help the skilled service technician to service and repair the TEAC C-1 Stereo Cassette Deck. It is a highly sophisticated deck incorporating many advanced features to satisfy the demands of the purist. These include three motors, three heads, dual capstan drive, plug-in bias/EQ cards, peak level meters, electronic signal switching and many more.

The data given in this manual should enable the competent technician to maintain the professional standards of which this deck is capable. However, if any of the adjustments or repairs are too difficult or complicated to accomplish, please contact the nearest TEAC Factory Service Department or write directly to a TEAC office. TEAC addresses are printed on the back cover of this Service Manual.

NOTE: When ordering replacement parts, please refer to the PARTS LIST which is printed separately from this manual and included as an insert.

TEAC CORPORATION
51032320

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* Noise reduction circuit made under license from Dolby Laboratories. The word "Dolby" and the Double-D symbol are trademarks of Dolby Laboratories.

1. PARTS LOCATION

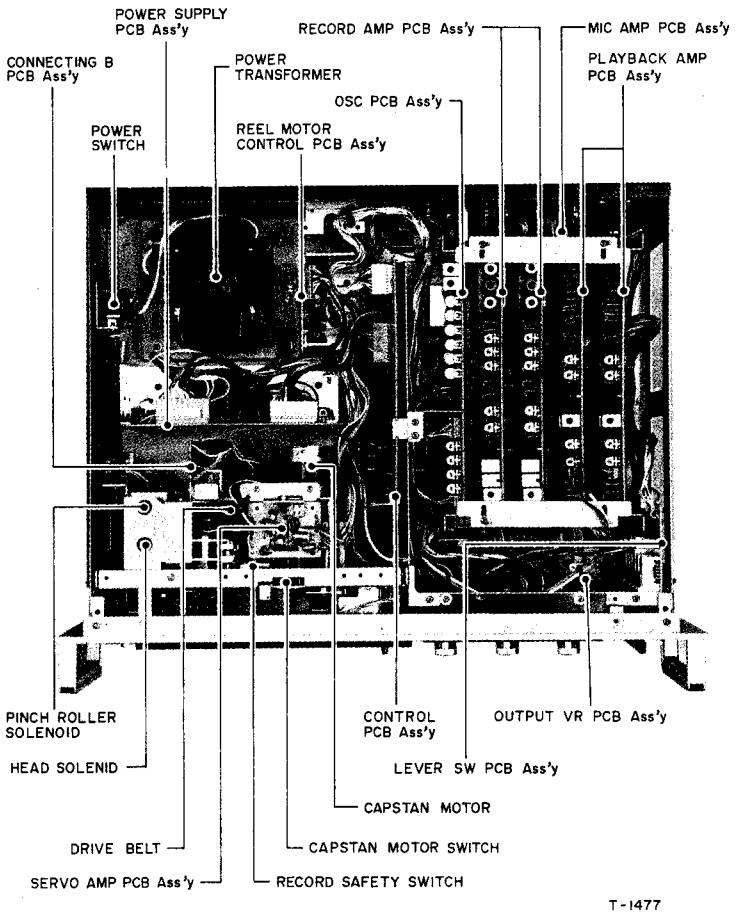


Fig. 1-1 Top view

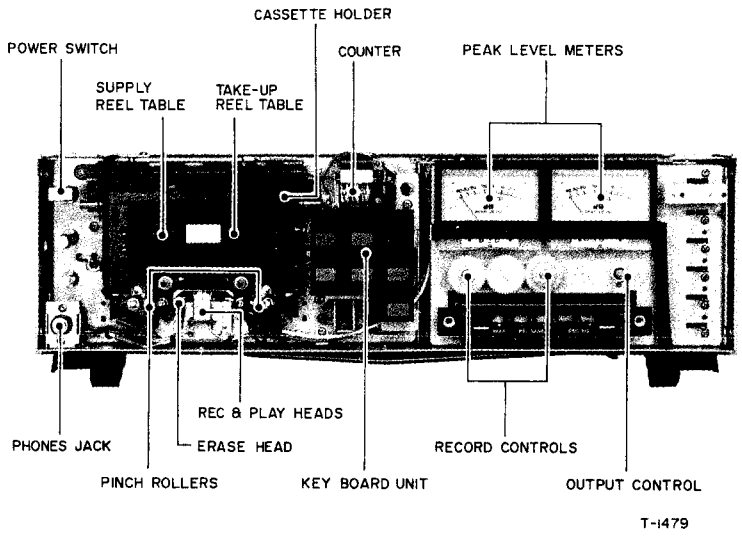


Fig. 1-2 Front view

2. SPECIFICATIONS & SERVICE DATA

SPECIFICATIONS

Track System	4-track, 2-channel stereo
3 Heads	Erase, Record and Playback
Type of Tape	Cassette tape, C-60 and C-90 (Philips type)
Tape Speed	4.8 cm/s (1-7/8 ips)
Inputs	MIC: Min. input level: –67 dB (345 μV)/(10 kohms)
(level and impedance)	MIC ATT: Min. input level: –47 dB (3.46 mV)
	LINE IN: Specified input level: –9 dB (274 mV)/(50 kohms)
	Min. input level: –19 dB (86 mV)
Outputs	OUTPUT: Max. ouput level: +1 dB (0.869V)/(50 kohms)
(level and load impedance)	Specified output level: –5 dB (435 mV)
	Headphones: Specified output level: –15.7 dB (130 mV)/(8 ohms)
Equalization	CrO_2: 3180 μs + 70 μs
	FeCr: 3180 μs + 70 μs
	NORMAL: 3180 μs + 120 μs
Head Configuration	1/2-track, 1-channel Erase Head
	1/4-track, 2-channel Dual-gap Record and Playback Heads
3 Motors	1 Phase Locked Loop Servo Controlled DC Capstan Motor
	2-DC Coreless Reel Motors
Bias Frequency	100 kHz
Operating Position	Horizontal
Power Requirements	100/117/220/240 V AC, 50/60 Hz (General Export Models)
	117 V AC, 60 Hz (USA/Canada Models)
	220 V AC, 50 Hz (Europe Model)
	240 V AC, 50 Hz (U.K./Australia Models)
Power Consumption	39 W
Weight	14.5 kg (32 lbs.) net

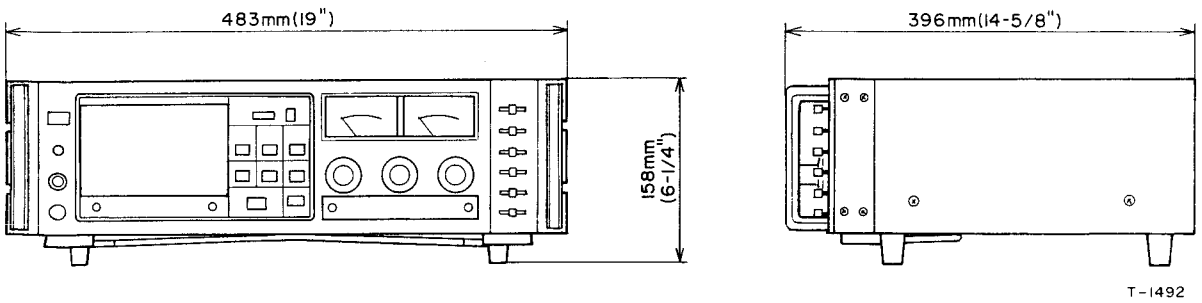


Fig. 2-1 Dimensions

SERVICE DATA

Mechanical

Tape Speed Deviation	3,000 Hz ±30 Hz
Tape Speed Drift	15 Hz
Wow and Flutter	Playback: 0.06% (WRMS) 0.12% (RMS) Record/Playback: 0.09% (WRMS) 0.15% (RMS)
Pinch Roller Pressure	Take-up: 500 g ±20 g (16.9 oz. to 18.3 oz.) Supply: 250 g ±20 g (8.1 oz. to 9.5 oz.)
Reel Torque	Take-up: 44 ± 4 g·cm (0.56 to 0.67 oz-inch) Supply: 7 to 10 g·cm (0.10 to 0.14 oz-inch) Fast Forwind/Rewind: 100 to 150 g·cm (1.4 to 2.1 oz-inch)
Fast Winding Time	70 seconds for MTT-501 (C-60)

Electrical

Frequency Response	Refer to frequency response limits charts on page 19 and 23
Signal to Noise Ratio	Playback method: CrO_2 & FeCr tapes: 51 dB (min.) NORMAL tape: 47 dB (min.) Record/Playback method: CrO_2 & FeCr tapes: 48 dB (min.) (UNWTD) 54 dB (min.) (WTD) NORMAL tape: 45 dB (min.) (UNWTD) 51 dB (min.) (WTD) With Dolby Noise Reduction used for recording and playback, S/N ratio is improved by 5 dB at 1 kHz and 10 dB at frequencies over 5 kHz.
Erase Efficiency	65 dB min.
Channel Separation	35 dB min. (at 1 kHz)
Crosstalk Between Adjacent Tracks	40 dB min. (at 125 Hz)
Total Harmonic Distortion	2.0% or iess w/3 types of tape

NOTE:
- Improvements may result in Specifications and Service Data changes.
- Value of "dB" in the Data refers to 0 dB = 0.775V, except where specified. If a Test Set or AC Voltmeter calibrated to 0 dB = 1 V is to be used, appropriate compensation should be made.

3. TEST EQUIPMENT

NOTE: When ordering special tools, jigs and test tapes, allow for the longer delivery time that is required for them.

3-1 ORDINARY TOOLS AND EQUIPMENT

1.	**Spring scale:**	For pinch roller pressure check, 0 to 1 kg (2.2 lbs)
2.	**Wow/flutter meter:**	MEGURO DENPA SOKKI K.K., Model MK-668A, or D & R Co., Model FL-4B
3.	**Frequency counter:**	Digital type, capable of 10 Hz to 100 kHz indication
4.	**AF oscillator:**	10 kHz to 100 kHz
5.	**AC voltmeter:**	0.1 mV to 300 V
6.	**Attenuator:**	General purpose
7.	**Distortion analyzer:**	Basic frequency 400 Hz/1 kHz
8.	**Oscilloscope:**	General purpose
9.	**Band-pass filter:**	1 kHz narrow band-pass type
10.	**Test load resistor:**	Non inductive type 8 ohm/1 W
11.	**Plastic alignment tool:**	
12.	**Head demagnetizer:**	TEAC E-3 or equivalent
13.	**Cleaner:**	TEAC TZ-261 tape recorder cleaner kit or pure alcohol
14.	**Oil:**	TEAC TZ-255 oil kit or equivalent
15.	**Bulk tape eraser:**	TEAC E-2 equivalent

3-2 SPECIAL TOOLS AND JIGS

1.	**Cassette torque meter:**	For take-up and supply torque checks, 0 to 100 g·cm (0 to 1.4 oz·inch)
2.	**Cassette torque meter:**	For test forward and rewind torque checks, 0 to 160 g·cm (0 to 2.2 oz·inch)
3.	**Mirror-equipped tape path test tape:**	
4.	**Check base plate jig:**	Part No. 50306100 *1
5.	**Guide height check jig:**	Part No. 50306130 *2
6.	**Crab-eye driver:**	For screwing or unscrewing crab-eye screws
7.	**Extender card D:**	For PLAYBACK AMP PCB ass'y checks, part No., 51688400
8.	**Extender card E:**	For RECORD AMP PCB ass'y checks, part No. 51688410
9.	**Extender card F:**	For OSC PCB ass'y checks, part No. 51688420
10.	**Extender card G:**	For CONTROL PCB ass'y checks, part No. 51688430
11.	**Extender cord 1:**	6P, for OSC PCB ass'y, part No. 51274840, two used
12.	**Extender cord 2:**	3P, for OSC PCB ass'y, part No. 51274850

*1 Check base plate jig (part No. 17850500-00) for A-860 may be used in place of this.
*2 Pinch roller height check jig (part No. 17850502-00) for A-860 may be used in place of this.

3-3 TEAC TEST TAPES

REMARKS: 0 dB = DIN reference level (333 Hz)

For tape speed and wow/flutter test

1.	**MTT-111:**	· For playback method · 3,000 Hz/-10 dB
2.	**MTT-501:**	· For record/playback method (blank tape)

For playback performance alignment

3.	**MTT-150:**	· For Dolby level calibration · Dolby B-type tone (400 Hz tone), 200 nWb/m
4.	**MTT–316:**	· For frequency response test for EQ, CrO_2 and FeCr · 3,180 μs + 70 μs · 315 Hz/-4 dB, 31.5 Hz to 14 kHz/-24 dB
5.	**MTT-216:**	· For ferquency response test for EQ, NORMAL · 3,180 μs + 120 μs · 315 Hz/-4 dB, 31.5 Hz to 14 kHz/-24 dB

For record performance alignment (blank tape)

6.	**MTT-506 or similar:**	· For BIAS/EQ, CrO_2
7.	**MTT-504 or similar:**	· For BIAS/EQ, FeCr
8.	**MTT-501 or similar:**	· For BIAS/EQ, NORMAL

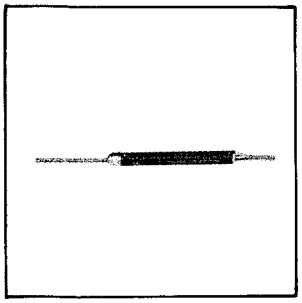


Fig. 3-1 Spring scale

Fig. 3-2 Plastic alignment tools

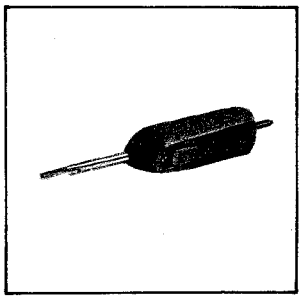


Fig. 3-3 E-3 head demagnetizer

Fig. 3-4 TZ-261 tape recorder cleaner kit

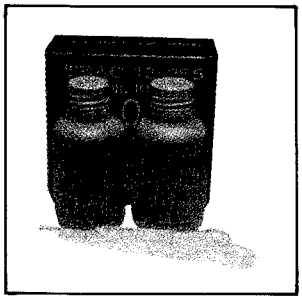


Fig. 3-5 TZ-255 oil kit

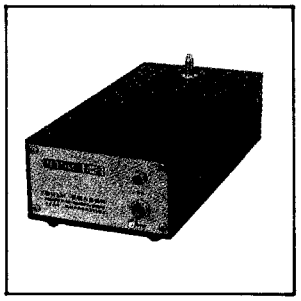


Fig. 3-6 E-2 bulk tape eraser

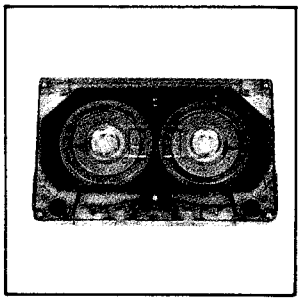


Fig. 3-7 Cassette torque meter

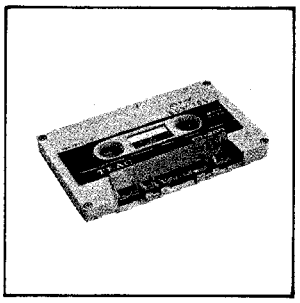


Fig. 3-8 Mirror-equipped tape path test tape

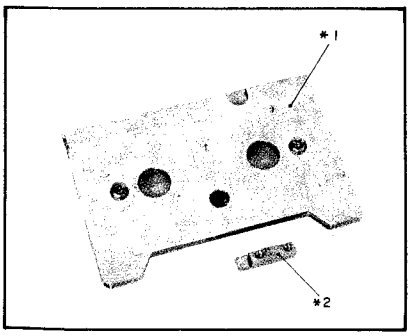


Fig. 3-9 Check base plate jig (*1) and guide height check jig (*2)

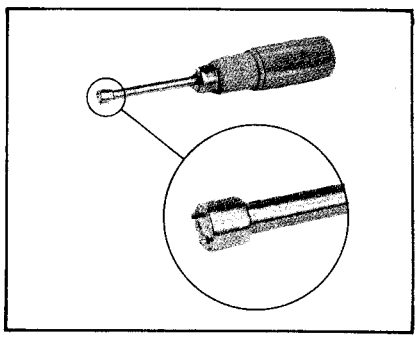


Fig. 3-10 Crab-eye driver

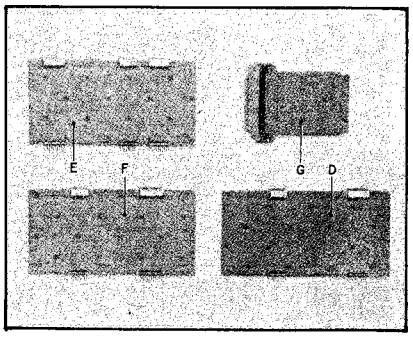
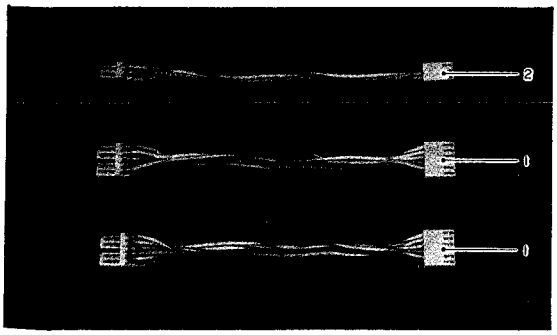


Fig. 3-11 Extender cards



Fif. 3-12 Extender cords

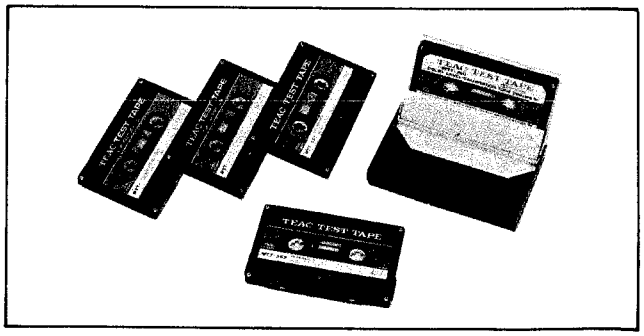


Fig. 3-13 TEAC test tapes

4. ILLUSTRATED DISASSEMBLY PROCEDURES

GENERAL NOTES

1. Disassemble in number-order.
2. Use the proper tools. Demagnetize the tools before use.
3. When mounting or removing a spring, check the position (direction) of the anchor or hook. The wrong position may change the tension.
4. When reassembling, don't forget to reinstall all hardware such as springs and washers etc.
5. To check the shape of assembling hardware (screws, etc.), see ASSEMBLING HARDWARE CODING LIST in the parts list.

4-1 CASE AND FRONT PANEL

NOTE: When disassembling the head cover (8), a special tool is required to remove the "crab-eye" screws (7). Refer to paragraph 3. TEST EQUIPMENT.

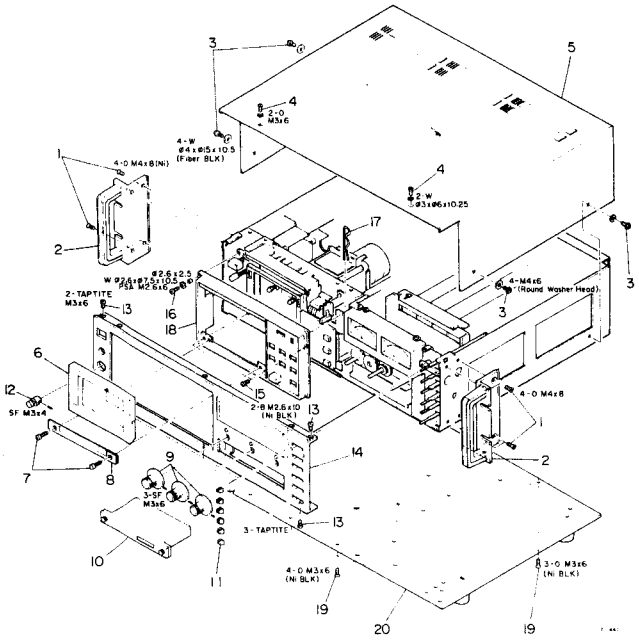


Fig. 4-1 Case and front panel

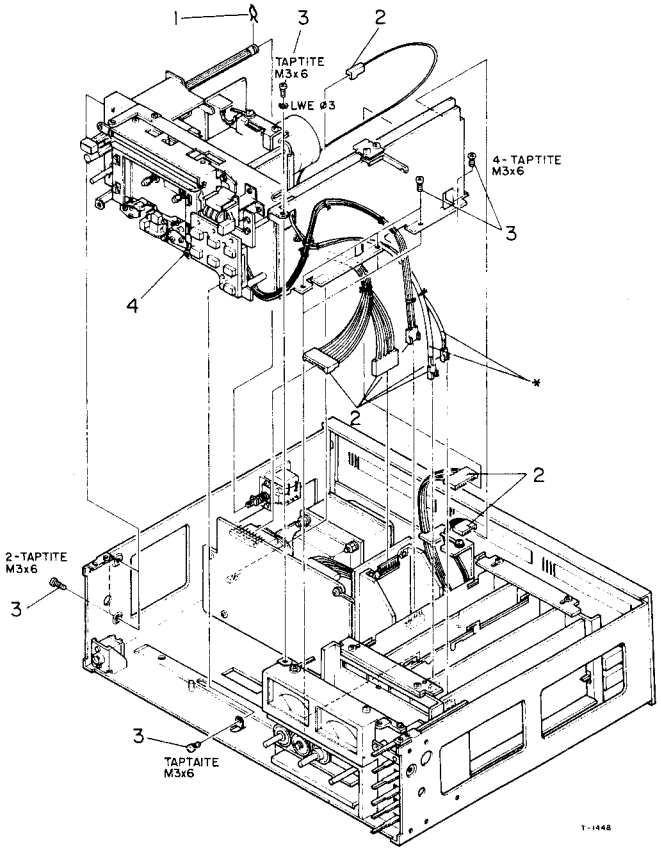
4-2 TAPE TRANSPORT CHASSIS

Preparation

Remove in number-order.

Fig. 4-1, 1-thru-18 except 10.

NOTE: "1-thru-18" means all, including No. 1 and No. 18 (but not No. 10).



NOTE: * RED = RIGHT CHANNEL
WHITE = LEFT CHANNEL

Fig. 4-2 Tape transport chassis

4-3 CASSETTE HOLDER

Preparations

Remove in number-order.

1. Fig. 4-1, 1-thru-18 except 10.
2. If necessary, Fig. 4-2, 1, 3, 4.

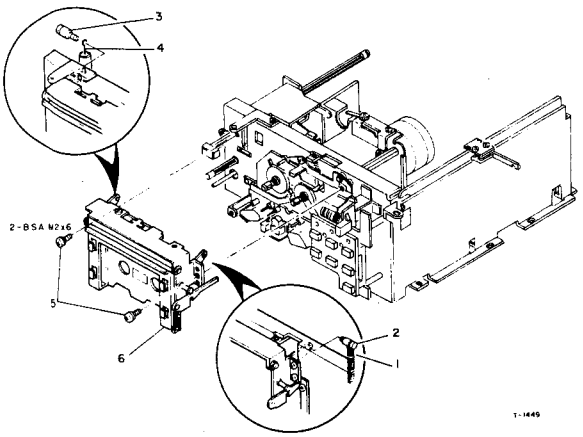


Fig. 4-3 Cassette holder

4-4 REEL TABLES AND BRAKES

Preparations

Remove in number-order.

1. Fig. 4-1, 1-thru-18 except 10.
2. Fig. 4-3, 1-thru-6.

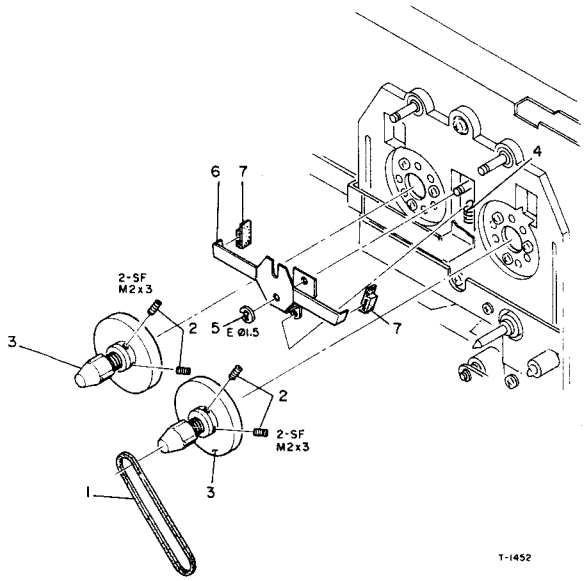


Fig. 4-4 Reel tables and brakes

4-5 HEADS AND PINCH ROLLERS

Preparation

Remove in number-order.

Fig. 4-1, 1-thru-18 except 10.

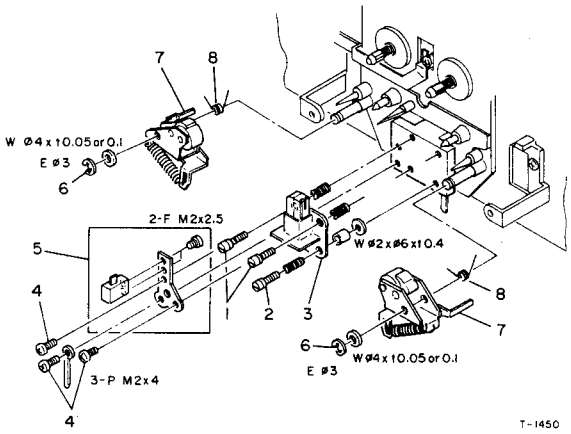


Fig. 4-5 Heads and pinch rollers

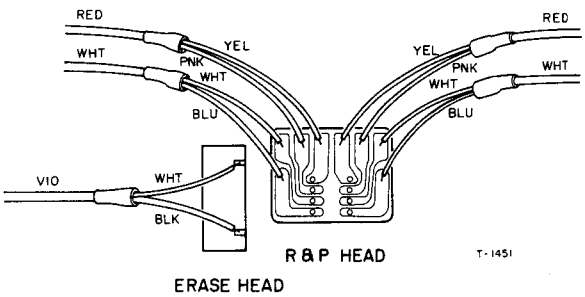


Fig. 4-6 Head wiring diagram

NOTES: 1. After replacing the head, always adjust the head alignment, especially the R & P head's azimuth (see 6-3-1,) and then secure the screws with a drop of locking paint.

2. Solder the wires to the head terminal pins quickly (to prevent breaking of internal wires of the head due to overheating).
3. After replacement, always clean the driving surfaces of the pinch rollers with the TEAC TZ-261B rubber cleaner or with pure alcohol. Then go directly to paragraphs 5-8, 5-9 and 5-10 in order.

4-6 CAPSTAN MOTOR

Preparations

Remove in number-order.

1. Fig. 4-1, 1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14.
2. Fig. 4-2, 1, 3, 4.

NOTE: When re-assembling the capstan motor, clean its pulley and the drive belt with TEAC TZ-261 cleaner kit ("A" for the pulley, "B" for the belt) or with pure alcohol.

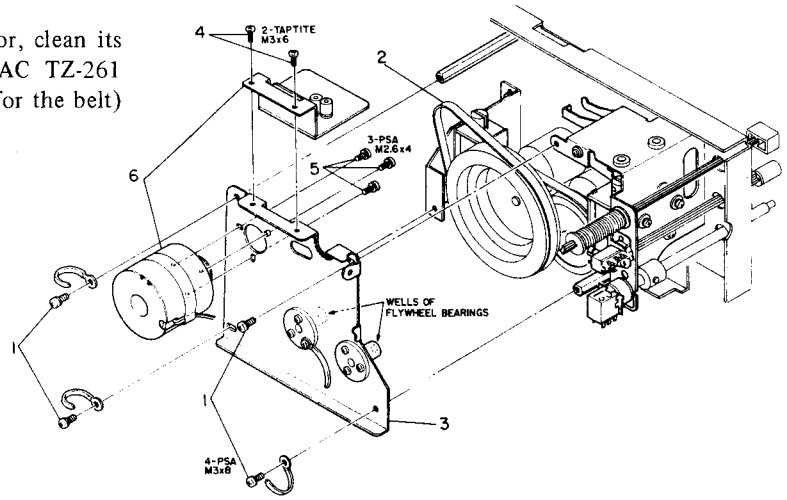


Fig. 4-7 Capstan motor

4-7 CAPSTAN ASS'YS (INCLUDING LUBRICATION)

Preparations

Remove in number-order.

1. Fig. 4-1, 1-thru-18 except 10.
2. Fig. 4-2, 1, 3, 4.
3. Fig. 4-3, 1-thru-6.
4. Fig. 4-7, 1, 2, 3.

NOTE: 1. Clean all driving surfaces of the capstan ass'ys and the drive belt with TEAC TZ-261 cleaner kit ("A" for flywheel, "B" for belt) or with pure alcohol.

2. After remounting or replacing the capstan ass'y(s), go directely to paragraph 5-7.

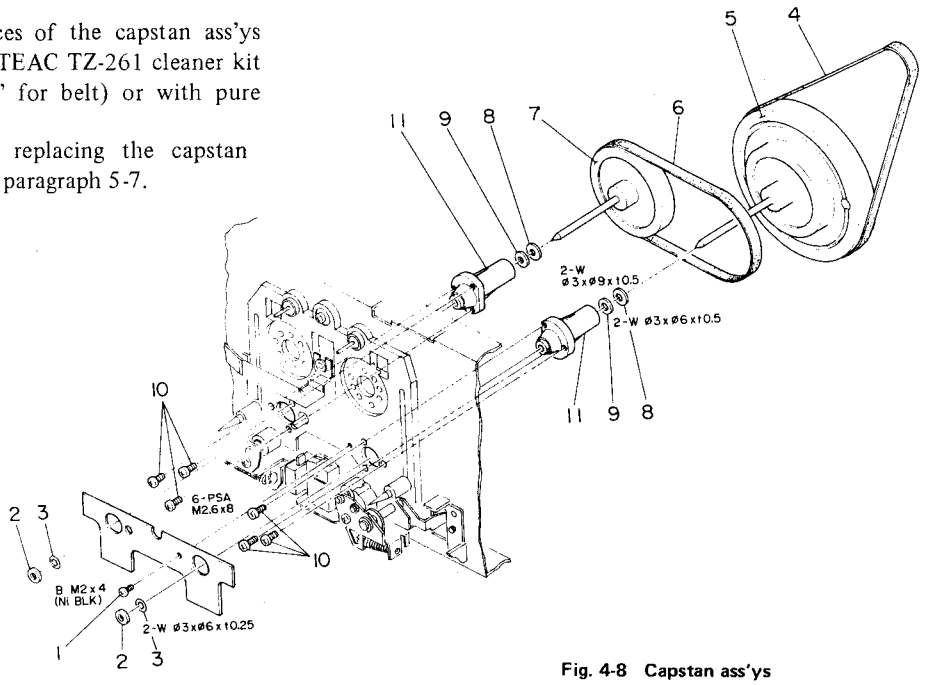


Fig. 4-8 Capstan ass'ys

LUBRICATION

Lubrication should be generally done at about every 1,000 hours of operating time of the tape deck. Use high quality oil for this purpose.

For efficient oiling, it is recommended that lubrication be done after nearly 1 hour of idling of the deck and while it is still warm.

1. Apply a drop of a light machine oil of good quality (e.g.: TEAC TZ-255) with an oil applicator to the shaft of the flywheels and spread oil evenly over the shaft with a flannel cloth. After installing the flywheel, be sure to clean the tape moving portion of shaft with TEAC TZ-261 A head cleaner or with pure alcohol.
2. Apply a drop of the proper oil in the same way as above to the innermost area of capstan shaft (next to the flywheel).
3. Apply a film of light grease to the well of the flywheel bearing (See Fig. 4-7.)

4-8 REEL MOTORS

Preparations

Remove in number-order.

1. Fig. 4-1, 1-thru-18 except 10.
2. Fig. 4-2, 1, 3, 4.
3. Fig. 4-3, 1-thru-6.
4. Fig. 4-4, 1, 2, 3.
5. Fig. 4-7, 1, 2, 3.
6. Fig. 4-8, 4, 5, 6, 7, 8, 9.

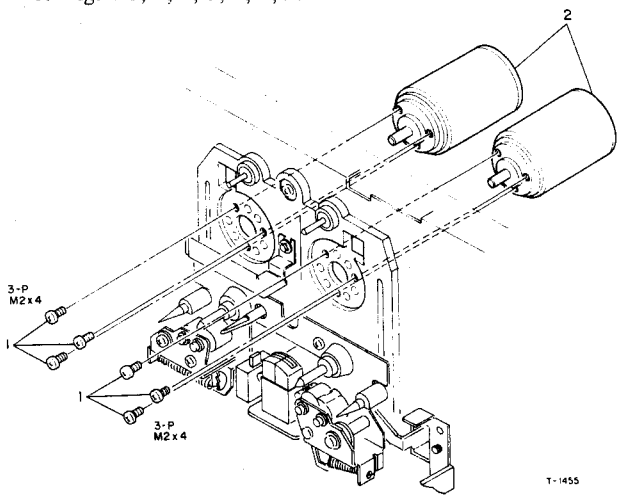


Fig. 4-9 Reel motors

5. MECHANICAL CHECKS AND ADJUSTMENTS

5-1 CASSETTE HOLDER TIMING ADJUSTMENT

1. Insert any standard cassette tape into the cassette holder and push the holder into the lock-close position.
2. Turn the set screw so that at the moment the cassette pressure lever clamps down onto the cassette, the lock cam will snap down onto the lock plate.
3. Secure the screw with a drop of locking paint after completing the above procedures.

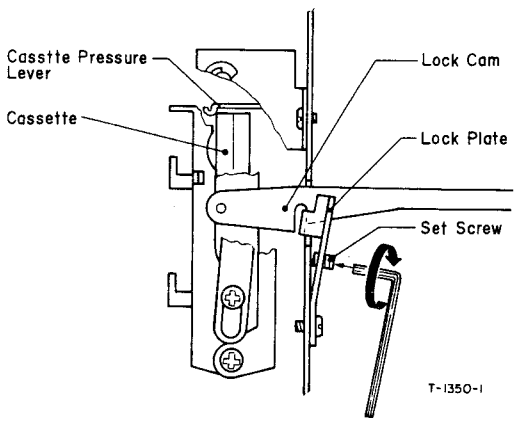


Fig. 5-1 Cassette holder timing adjustment

5-2 HEAD SOLENOID POSITION ADJUSTMENT

1. Switch on POWER.
2. Close the cassette holder with no tape loaded and press the cassette pressure arm shown in Fig. 5-3.
3. Place the deck in the play mode to engage the head solenoid.
4. Adjust the solenoid position by loosening the two screws and move the solenoid in either direction shown by the arrow (Fig. 5-5 on page 12) so that, when the flange at the top of the slide lever (B) is raised using the finger nail, a clearance of approx. 0.5 mm between the slide lever (B) and the solenoid lever (A) is obtained.
5. Retighten the two screws and secure them with a drop of locking paint.

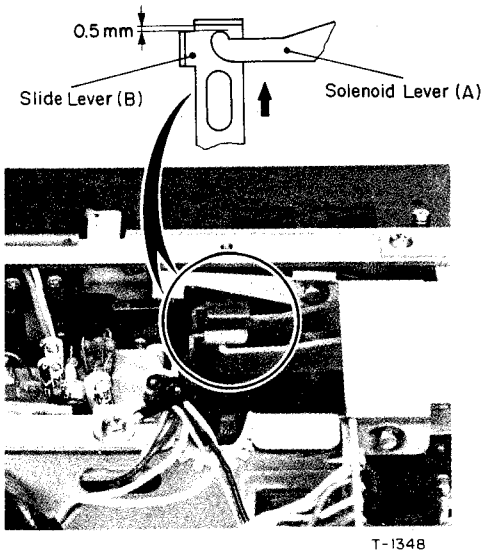


Fig. 5-2 Head solenoid position adj. location

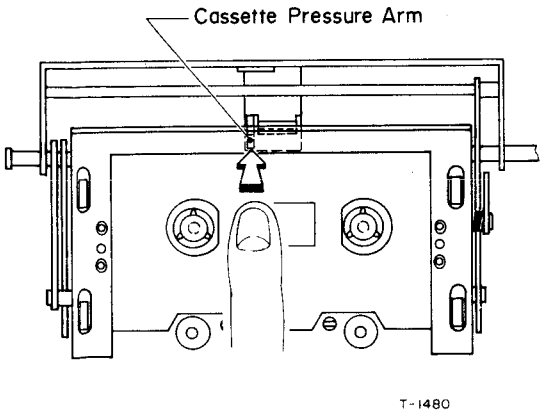
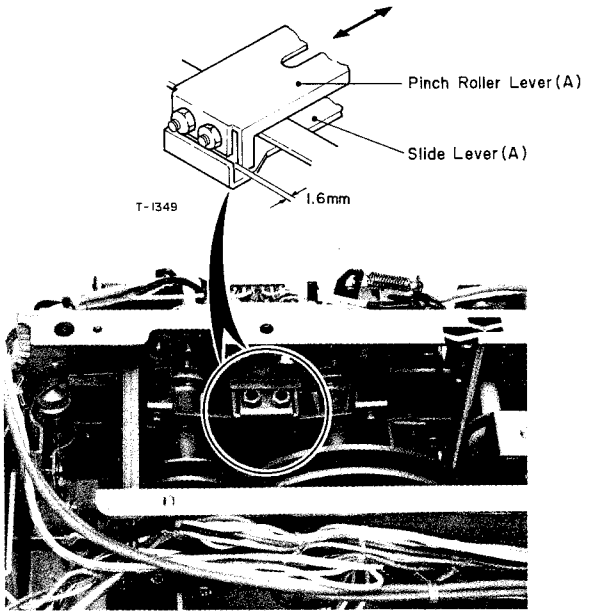


Fig. 5-3 Cassette pressure arm location

5-3 PINCH ROLLER SOLENOID POSITION ADJUSTMENT

NOTE: If head solenoid position adjustment is necessary in addition to adjustment of this section, do the head solenoid position adjustment first, then do this section's adjustment.

1. Separate the tape transport chassis from the main chassis. For details, refer to paragraph 4-2 on page 8.
2. Switch on POWER.
3. To activate both pinch roller and head solenoids, place the deck in the play mode with no tape loaded. In doing so, refer to 5-2, steps 2 to 3.
4. Adjust the solenoid position by loosening the two screws and slide the solenoid in either direction of the arrow until a clearance of approx. 1.6 mm between the pinch roller lever (A) and slide lever (A) is obtained.
5. Retighten the two screws and secure them with a drop of locking paint.



Viewed from bottom of transport chassis

Fig. 5-4 Pinch roller positioning adj. location

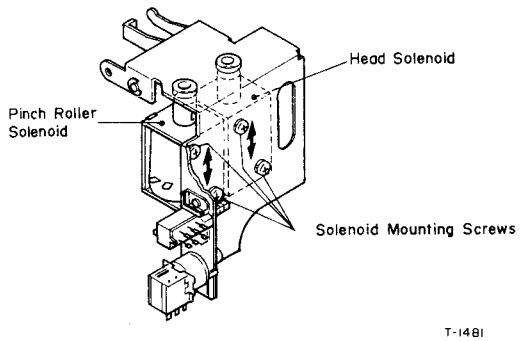


Fig. 5-5 Head/pinch roller solenoid adjustments

5-4 CAPSTAN MOTOR SWITCH POSITION ADJUSTMENT

1. Switch on POWER.
2. Be sure that when inserting a cassette tape in the cassette holder and closing it, the capstan motor switch is firmly actuated to run the capstan motor.
3. If the capstan motor does not rotate, loosen the two screws then turn the screw on the left of the switch housing in either direction, shown by the arrow, so that the switch is on. And then temporarily retighten the loosened screws.
4. Then depress EJECT button to open the cassette holder. At this time, make certain that the switch is shut off to stop the Motor rotation shortly before the actuated cassette pressure lever is locked.
5. Ensure that when the EJECT button is pushed down fully, the switch housing and the actuator of the switch do not make contact.
6. Tighten the screws firmly and apply a drop of locking paint to secure them after finishing the above steps.

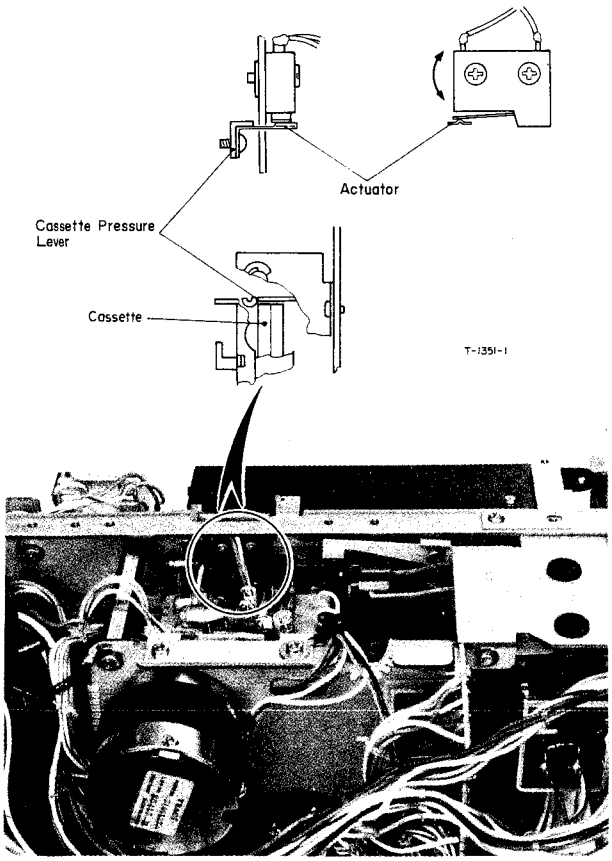


Fig. 5-6 Capstan motor switch position adjustment

5-5 RECORD SAFETY SWITCH POSITION ADJUSTMENT

1. Remove the servo amplifier PC baord ass'y by unscrewing the two screw shown in Fig. 5-8 for later adjustment.
2. Switch on POWER.
3. Shut the empty cassette holder.
4. Loosen the two screws on the record safety switch then adjust the switch position by rotating the right screw in either direction of the arrow so that when closing the holder, the switch can be firmly closed by the relay lever.
5. Temporarily retighten the screws after doing so.
6. Open the cassette holder, insert a blank cassette in the holder and close the holder.
7. Insure that when depressing the RECORD button together with the play button, deck is set in the record mode.
8. Tighten the screws and secure them with a drop of locking paint.

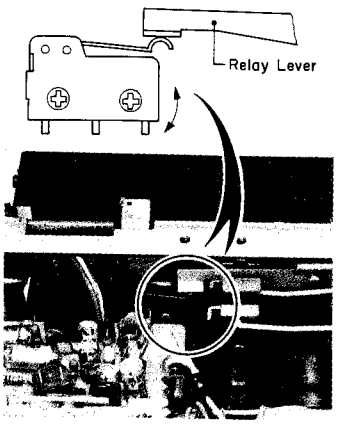


Fig. 5-7 Record safety switch position adjustment

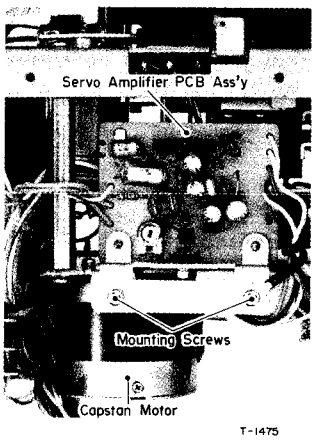


Fig. 5-8 Servo ampl. PCB ass'y location

5-6 BRAKE SOLENOID POSITION ADJUSTMENT

1. Switch on POWER.
2. Load any cassette tape.
3. Put the deck in the play mode to actuate the brake solenoid for the following checks.
4. Make sure that there is a clearance of approx. 1.0 mm or more between the reel table driving surfaces and the brake shoes of the brake plate.
5. Be sure that position relationship between the bent tip of the lever and the left hand end of the eject lever is as shown in Fig. 5-9.
6. Make certain that the EJECT function is inhibited.
7. If the items specified before cannot be obtained, adjust the brake solenoid position thus: loosen the two mounting screws on the brake solenoid, adjust the solenoid position, retighten the screws and secure them with a drop of locking paint.

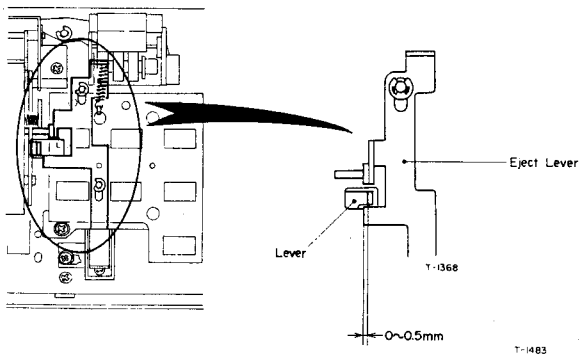


Fig. 5-9 Lever and eject lever clearance

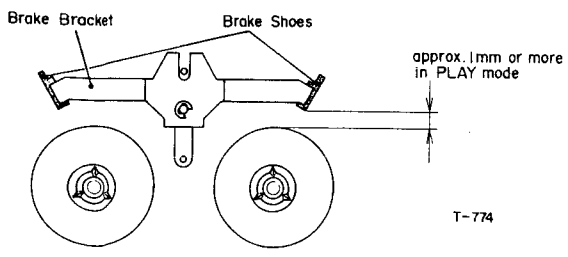


Fig. 5-10 Reel table and brake shoe clearance

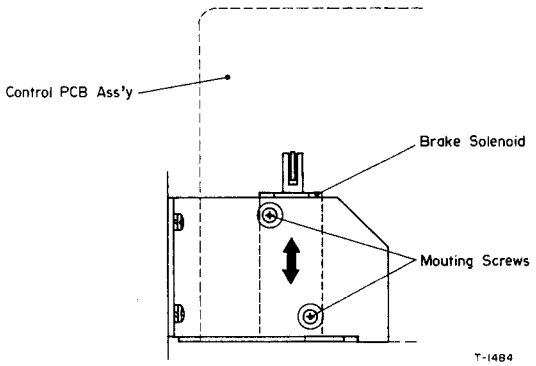


Fig. 5-11 Brake solenoid adj. location

5-7 CAPSTAN ASSEMBLY THRUST ADJUSTMENT

Specification: 0.1 mm to 0.3 mm

NOTE: For newly replaced capstan drive ass'y first lubricate it referring to paragraph 4-7 on page 11 prior to this adjustment.

1. Switch off POWER.
2. Remove the POWER SUPPLY PC board ass'y located behind the transport chassis, from the bottom of main chassis by unfastening two screws as shown in Fig. 5-14.
3. Keep approx. 1 mm of clearance between the capstan ring and the top end of the capstan holder so that the ring will not disturb accurate adjusting of the capstan shaft thrust.
4. By using a slot screwdriver with small blade, adjust the thrust adjusting screw so that thrust of the capstan shaft in the longitudinal direction is limited to 0.1 to 0.3 mm. This adjustment can be made by pushing the flywheel toward or away from the front of the deck.
5. Adjust the capstan ring height so that, with the lower end of the capstan shaft in contact with the adjusting screw, there is 0.5 mm clearance between the ring and the top end of the capstan holder.

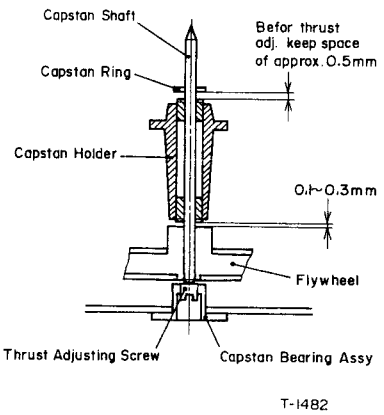


Fig. 5-12 Cross sectional view of capstan ass'y

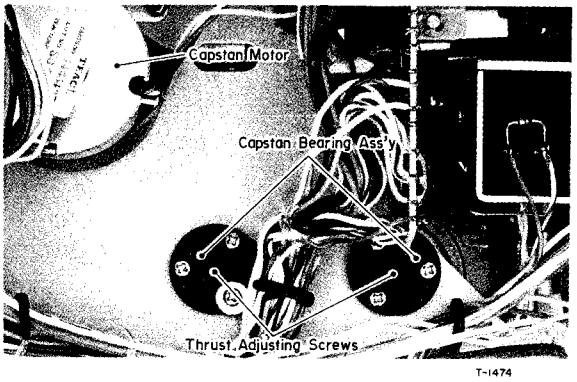


Fig. 5-13 Capstan thrust adj. location

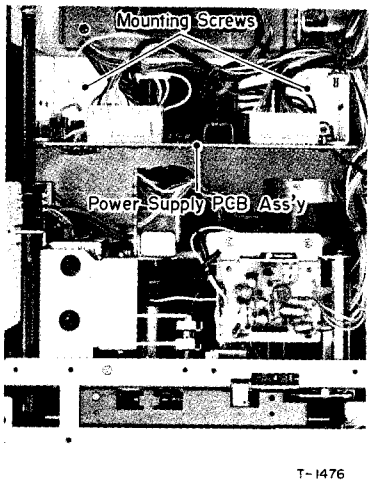


Fig. 5-14 Power supply PCB ass'y location

5-8 PINCH ROLLER POSITION BALANCE

NOTE: Although there are two separate pinch roller ass'ys which are on the left hand side and right hand side of the head ass'y, only the right hand side pinch roller figures are illustrated. All the descriptions in this section, however, apply to both pinch rollers.

1. Separate the tape transport chassis from the main chassis. For detailed procedure refer to paragraph 4-2 on page 8.

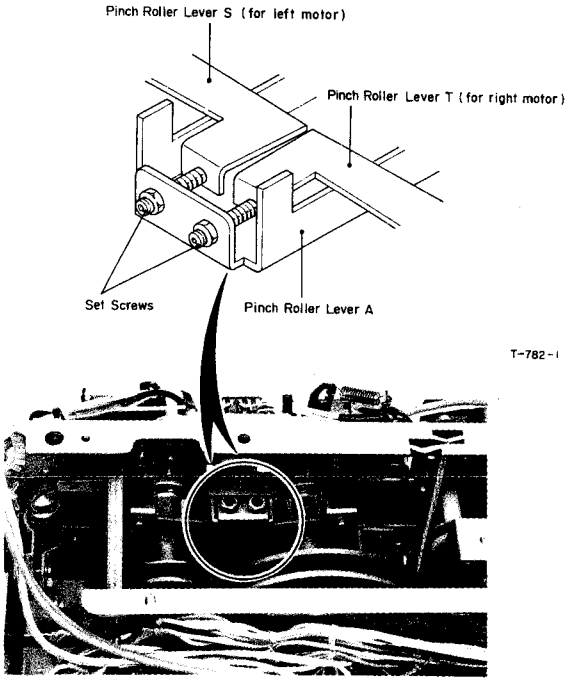

Pinch Roller Lever S (for left motor)
Pinch Roller Lever T (for right motor)
Set Screws
Pinch Roller Lever A
T-782-1
Viewed from bottom of transport chassis

Fig. 5-15 Pinch roller positioning adj. location

2. Switch on POWER.
3. Place the deck in the play mode with no tape loaded. In doing so refer to 5-2, steps 2 to 3.
4. Adjust the set screw located on the lower bent-portion of the pinch roller lever A for the pinch roller that requires adjustment due to replacement of the pinch roller or due to pinch roller pressure being incorrect.
5. Turn the adjustment screw until the pinch roller touches the capstan shaft and then turn screw in the same direction about two turns (revolutions) for initial coarse placement adjustment.
6. After doing so, tighten the locking nut.
7. After completing the above, operate the deck in the pause mode with no tape installed.

   NOTE: When in the pause mode without cassette tape it is absolutely necessary to close the cassette holder first before selecting the pause mode to prevent physical damage to the head.

8. Make certain that there is a 0.5 mm to 1 mm clearance between the pinch roller and capstan shaft.

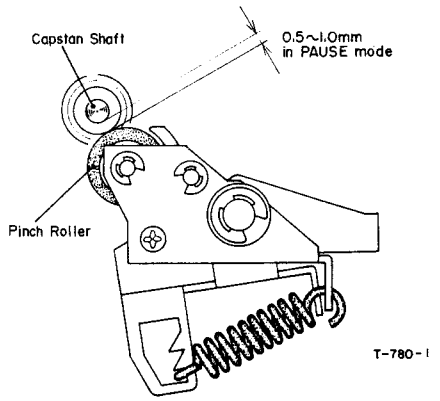


Fig. 5-16 Pinch roller and capstan shaft clearance

5-9 PINCH ROLLER PRESSURE

Specifications: Take-up: 500 g ±20 g (16.9 oz. to 18.3 oz.)
Supply: 250 g ±20 g (8.1 oz. to 9.5 oz.)

NOTE: Explanation in this section can be applied to both left and right pinch rollers though only the right one is illustrated.

1. Switch on POWER.
2. Place the deck in the play mode with no tape loaded. To do this, refer to 5-2, steps 2 to 3.
3. Hook the spring scale to the pinch roller shaft.
4. Gently draw the pinch roller away from the capstan shaft in a direction directly downwards until the capstan shaft and the pinch roller are completely separated.
5. Gradually return the scale back until the pinch roller just begins to rotate. The scale should then be reading approx. 500 g ±20 g (16.9 oz. to 18.3 oz.) as the value of the take-up side pinch roller (right) and approx. 250 g ±20 g (8.1 oz. to 9.5 oz.) as the value of the supply side pinch roller (left).
6. If the reading is out of the specified range, adjust the tension of the pinch roller spring by bending the tab of the pinch roller ass'y in the direction specified by the arrow.

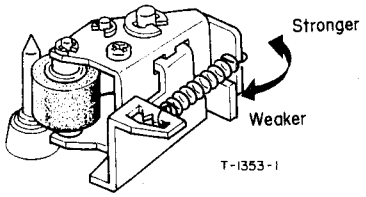


Fig. 5-17 Pinch roller pressure adjustment

5-10 ADJUSTING HEIGHT OF PINCH ROLLER GUIDES AND REC & PLAY HEAD

1. Load the check base plate jig in the cassette holder.
2. Attach the tip of the guide height check jig, resting the check base plate jig, under the pinch roller guide as illustrated in Fig. 5-18, keeping a reasonable distance from the capstan shaft in order not to scratch the shaft.
3. Using this jig, adjust the height of the guide by turning the height adjusting screw. Be careful not to scratch the tape driving surface of the guide. Make this adjustment for both right and left pinch rollers.
4. Move the height check jig into proximity with the front surface of the REC & PLAY head.
5. Carefully adjust the two height/azimuth screws until the tip of the jig just fits under the tape guide of the head as shown in Fig. 5-20.
6. At this time, adjustment should be done with the head parallel to the slide base (as far as possible).

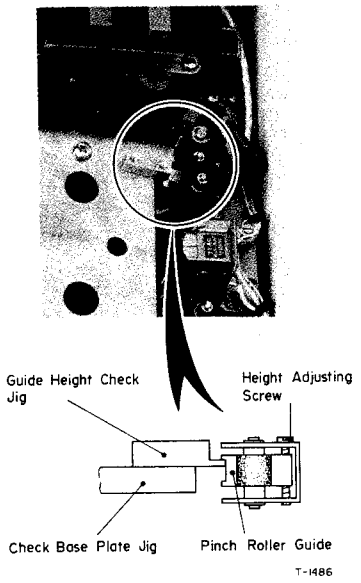


Fig. 5-18 Pinch roller guide adjustment

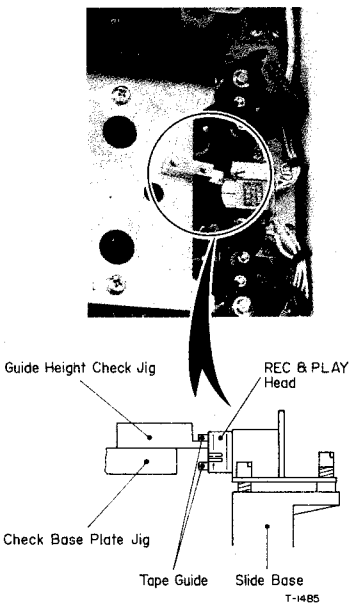


Fig. 5-19 Tape guide adjustment

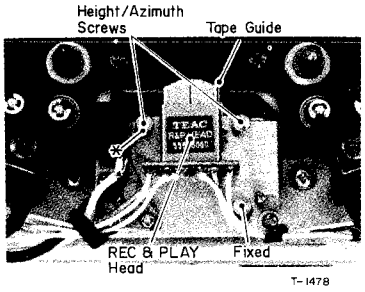
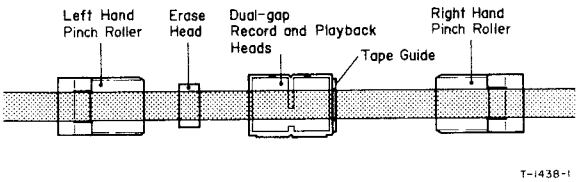


Fig. 5-20 Height azimuth screw location

5-11 TAPE PATH ALIGNMENT

1. Switch on POWER.
2. Install a "mirror-equipped tape path test tape".
3. Set the deck in the play mode, retracting the record & playback head manually so that the head does not contact the tape and causes disturbance for later adjustment.
4. In the play mode, check that both or either pinch roller guide(s) do not cause tape curling.
5. If the setting is wrong, fine-adjust the height of the take-up side pinch roller guide until the tape curling stops.
6. Gradually relax the head retraction until the deck is operating in the normal play mode. Check that the tape runs normally.
7. If there is tape curling, particularly at the supply side pinch roller guide, adjust the height of the tape guide of the REC & PLAY head by slightly turning the height azimuth screw near the guide (see item 5-10, Fig. 5-20). Then adjust the height of the take-up side pinch roller guide (see item 5-10, Fig. 5-18). Note that height adjustment of the supply side pinch roller guide is not permissible.
8. Adjust either or both height/azimuth screw(s) so that the head appears visually parallel to the tape.



* This diagram shows the head ass'y etc., as reflected by the mirror of TAPE PATH test cassette.

Fig. 5-21 Tape path diagram

5-12 TAPE SPEED ADJUSTMENT

Specifications:

Tape speed deviation:	3,000 Hz ±30 Hz
Tape speed drift:	15 Hz

NOTE: 1. Before performing this adjustment, clean all parts in the tape path, particularly the capstans, the pinch rollers and the heads with the appropriate liquid from the TEAC TZ-261 cleaner kit or with pure alcohol.
2. Tape speed setting should be done after approx. 30 seconds of operating time of the deck.

1. Connect test equipment to the deck, as shown in Fig. 5-22.
2. Set the OUTPUT control on the deck to obtain a suitable output level.
3. Set the MONITOR switch to TAPE OUTPUT and the EQ switch to NORMAL.
4. Load and play a TEAC MTT-111 test tape (3,000 Hz signal).
5. Check that the PITCH CONT switch knob is pushed in to prevent it from affecting the tape speed.
6. Adjust VR1 on the servo amplifier. PC board ass'y for a reading of 3,000 Hz ±5 Hz on the frequency counter, using an ordinary scerwdriver whose handle is completely insulated from the screwdriver blade.
7. Pull out the PITCH CONT switch knob to the ON position.
8. Adjust VR2 so that when the knob is centered, that is at the click point, the reading on the frequency counter is 3,000 Hz ±5 Hz.
9. If the tape speed is much out of specification, check the pinch roller pressure and the tape driving function and make sure the tape path is clean.

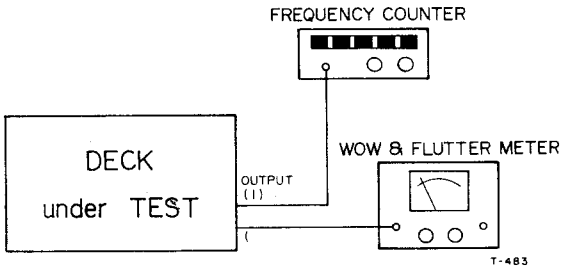


Fig. 5-22 Tape speed measurement setup

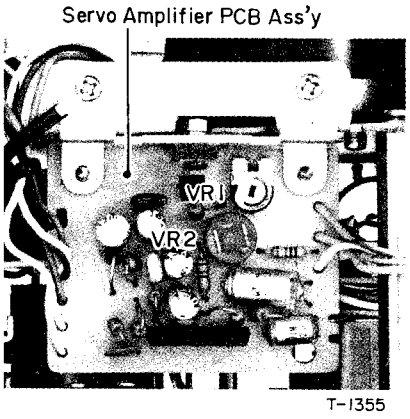
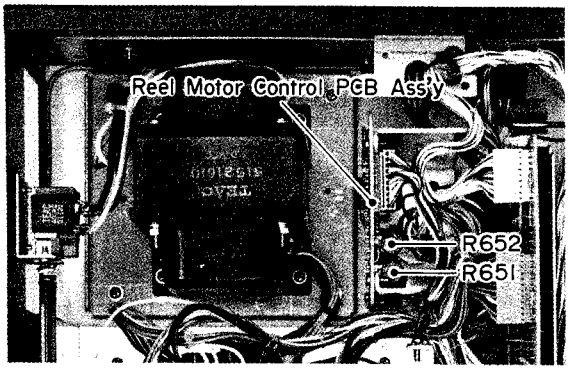


Fig. 5-23 Tape speed adj. locations

5-13 REEL MOTOR TORQUE ADJUSTMENT

Specifications: Take-up: 44 ±4 g·cm (0.56 to 0.67 oz·inch)
Supply: 7 to 10 g·cm (0.10 to 0.14 oz·inch)

1. Switch on POWER.
2. Load the cassette torque meter.
3. Place the deck in the play mode.
4. Reading the pointer indication on the dial scale, adjust R652 for the take-up torque of the right hand motor to indicate 44 ±4 g·cm (0.56 to 0.67 oz·inch).
5. While continuously playing, set R651 so that the supply torque of the left hand motor indicates 7 to 10 g·cm (0.10 to 0.14 oz·inch).



T-1473

Fig. 5-24 Reel motor torque adj. location

6. ELECTRICAL CHECKS AND ADJUSTMENTS

6-1 GENERAL PRELIMINARY INFORMATION

6-1-1 GENERAL NOTICE

1. Before performing adjustments on the amplifier section of this deck, thoroughly clean and demagnetize the entire tape path, particularly the erase head, record and playback heads capstan shaft and pinch roller.
2. Make sure the deck is properly set for the voltage in your locality.
3. In general, checks and adjustments, other than specified items, are done in the sequence – left channel then right channel. Double REF. Nos. indicate left channel right channel (example: VR101/VR201).
4. The value of "dB" in the text refers to 0dB = 0.775 V, except where specified. If an AC voltmeter calibrated to 0dB = 1 V is to be used, appropriate compensation should be made.
5. The AC voltmeter used in the procedures, including the measurements at DOLBY test points, must have an input impedance of 1 M-ohms or more.
6. To complete these performance checks correctly, follow the order given in this chapter.
7. All checks and adjustments should be made with the top cover and the front panel removed. See section 4-1.

6-1-2 PREPARATIONS

1. For each procedure, make the initial equipment test set up and connections as shown in the associated illustrations.
2. Unless indicated otherwise in the procedures, the basic starting conditions for each test will be as given in the chart below.

Switch	Position
MONITOR:	TAPE OUTPUT
NR SYSTEM:	OUT
INPUT:	LINE
AUTO REWIND:	OFF
EQ:	CrO_2
BIAS:	CrO_2 (OPTION)

6-2 DC VOLTAGE (+15 V) ADJUSTMENT

Adjust R929 on the power supply PCB for +15 V DC between the pin 6 of the terminal P901 on the PCB and the ground.

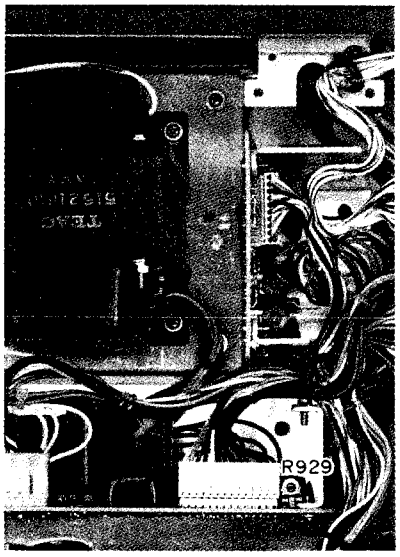


Fig. 6-1 DC voltage adjustment

6-3 PLAYBACK PERFORMANCE

6-3-1 RECORD/PLAYBACK HEAD AZIMUTH ADJUSTMENT

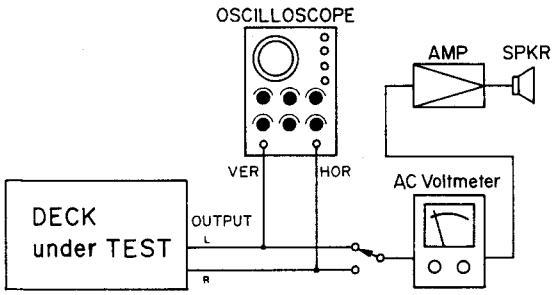


Fig. 6-2 Connection T-813

1. Load a TEAC MTT-316 test tape and play the 12.5 kHz section on the tape.
2. During playback, slowly adjust the azimuth adjusting screw (*in Fig. 5-20) so that the phase relationship between the L- and R-channels approximates 0 degrees as indicated on the oscilloscope.
3. At this time, ascertain that playback output level is approximately the maximum value on the AC voltmeter.
4. Then confirm that the phase difference of the respetive frequency is within the rated value. 90 degrees or less in the range of 40 Hz to 10 kHz is required.
5. Secure the screw with a drop of locking paint.

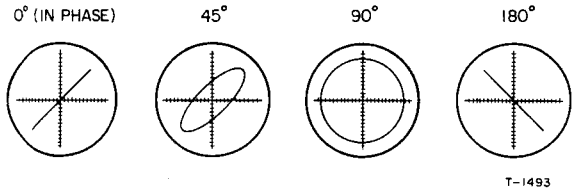


Fig. 6-3 Confirming phase relationship

6-3-2 SPECIFIED OUTPUT LEVEL SETTING

Specifications:

Specified output level: −5 dB (435 mV)

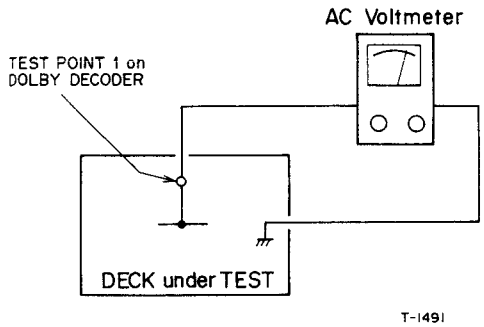


Fig. 6-4 Connection

1. Load and play a TEAC MTT-150 test tape.
2. Adjust R121 on both L- and R-channels, for 580 mV (−2.5 dB) on AC Voltmeter connected to test point 1 on the DOLBY DECODER.
3. Change the AC voltmeter connection to the OUTPUT jack of L-channel.
4. Turn OUTPUT control so that the L-channel output from the deck is set to produce the specified output level of −5 dB (435 mV).
5. Change the AC voltmeter connection to the OUTPUT jack of R-channel.
6. Adjust R896 for R-channel output of −5 dB.

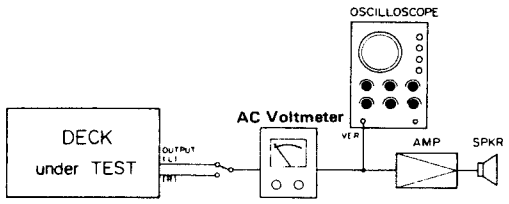


Fig. 6-5 Connection

6-3-3 FREQUENCY RESPONSE – PLAYBACK –

CrO_2 tape

7. Load a TEAC MTT-316 test tape and play the 4th section of the tape, voice labelled as 315 Hz, and note this reading as a temporary reference level for the following adjustments.
8. While playing the 10 kHz recorded section, adjust R112, of both L- and R-channels, so that 10 kHz gives the same level as the previous reference level in order to keep the higher frequency signals within the given response limits.
9. Then play the required signals for comparison with the playback frequency response limits chart.
10. Check that the readings obtained on the AC voltmeter are within the response limits.

NORMAL tape

11. After achieving the above, set the EQ switch to NORMAL and change the test tape to MTT-216.
12. Play the tape and check that the frequency response limits for NORMAL tape are within the given limits.

NOTE: If the response does not meet the specified response limits, the head should be checked for accumulated oxide or dirt. If no dirt is found, the head azimuth should be readjusted.

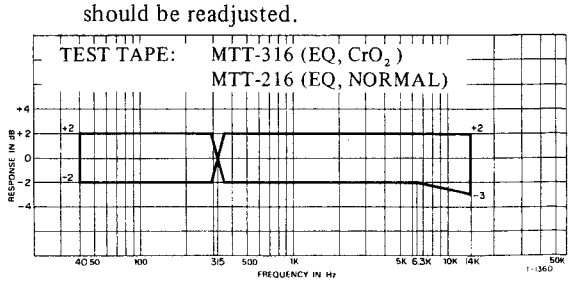


Fig. 6-6 Playback frequency response limits

6-3-4 SIGNAL TO NOISE RATIO – PLAYBACK –

Specifications:

EQ switch, CrO_2/FeCr: 51 dB (min.)
NORMAL: 47 dB (min.)

CrO_2 tape

1. Connect the deck and the test equipments as shown in Fig. 6-5 on page 19.
2. Load and play a TEAC MTT-150 test tape.
3. Confirm that by reproducing the 400 Hz test tone on the tape, the output from the deck is set to the specified output level of –5 dB (435 mV). If not, repeat the procedure in paragraph 6-3-2.
4. Change the tape to a TEAC MTT-506 test tape completely demagnetized by a bulk tape eraser (such as the TEAC E-2) and play it.
5. Read the indication on the AC voltmeter.
6. Compare the output reading to the specified output level (–5 dB).
7. A difference of 51 dB or more is required.

FeCr and NORMAL tapes

8. Repeat the "CrO_2" procedure with the following substitutions.

	FeCr tape	NORMAL tape
EQ switch:	FeCr position	NORMAL osition
Test Tape:	MTT-504	MTT-501

6-3-5 HEADPHONE OUTPUT LEVEL CHECKS

Specification: –15.7 dB ±2 dB (101 mV to 160 mV)

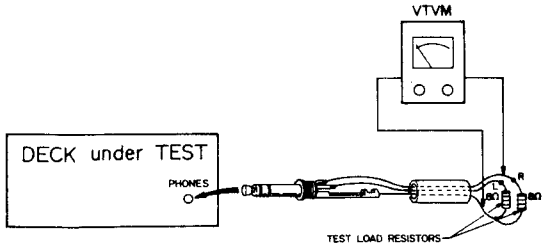


Fig. 6-7 Connection

NOTE: An 8 ohm non-inductive resistor should be used as the test load resistor.

1. Load and play a TEAC MTT-150 test tape.
2. Measure the level across the test load resistor.
3. Level should be –15.7 dB ±2 dB (101 mV to 160 mV).

6-4 MONITOR PERFORMANCE

6-4-1 MINIMUM INPUT LEVEL CHECKS

Specifications:

LINE: –19 dB ±2 dB (69 mV to 109 mV)
MIC: –67 dB ±2 dB (275 μV to 436 μV)
MIC ATT: –47 dB ±2 dB (2.75 mV to 4.36 mV)

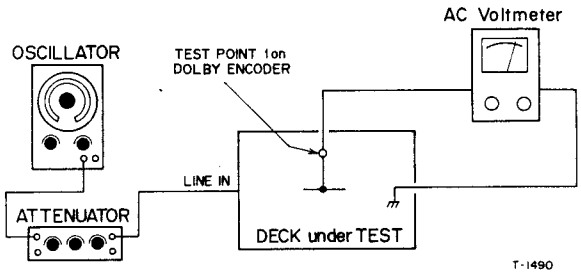


Fig. 6-8 Connection

NOTE: To prevent mis-measurements for the following procedures, any connection cords other than those for the respective input check must be removed.
For example: Do not connect microphone cords to the MIC jacks when checking the LINE IN inputs.

1. Load a blank tape.
2. Put the deck in the RECORD – PAUSE mode.
3. Set the RECORD controls to maximum and the INPUT switch to MIC.
4. Apply a 400 Hz signal at –67 dB (346 μV) to the MIC jacks and check for –2.5 dB ±2 dB (461 mV to 731 mV) on the AC voltmeter. (This is the minimum input level check for the MIC jack – INPUT switch in MIC position).
5. Place the INPUT switch in the MIC ATT position and check for –22.5 dB ±3 dB (41.4 mV to 82.0 mV). (This is the minimum input level check for the MIC jack – INPUT switch in the MIC ATT position).
6. Place the INPUT switch in the LINE position.
7. Apply a 400 Hz signal at –19 dB (86.9 mV) to the LINE IN jacks and check that the AC voltmeter shows –2.5 dB ±1 dB (518 mV to 652 mV). (This is the minimum input level check for the LINE IN inputs).

6-4-2 SPECIFIED RECORD CONTROL SETTING

Specification:

Specified input level: –9 dB (275 mV)

8. Change the connection of the AC voltmeter to the OUTPUT jacks as shown in Fig. 6-9 and place the MONITOR switch in SOURCE position.
9. Apply a 400 Hz signal at –9 dB (275 mV) to the LINE IN jacks.

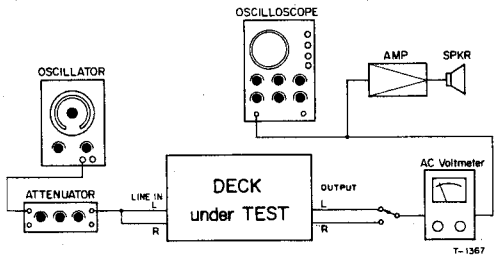


Fig. 6-9 Connection

10. Set the RECORD controls to obtain a reading of −5 dB (436 mV) on the AC voltmeter.
11. Change the AC voltmeter connection to test point 1 on the DOLBY ENCODER, of both L- and R-channels, and set the NR SYSTEM switch to the DOLBY position.
12. Check that the level at test points is within −2.5 dB ±0.5 dB (548 mV to 615 mV).
13. The determined physical position of the RECORD controls thus set indicates the specified RECORD control setting referred to in subsequent procedures.

IMPORTANT: After this setting has been made, do not disturb the specified control setting of the RECORD control until the remaining checks and adjustments are completed.

6-5 PEAK LEVEL METER ADJUSTMENTS

6-5-1 PEAK LEVEL METER CALIBRATION (INDICATION AND LINEARITY) – RECORD –

1. With the conditions given in paragraph 6-4-2, adjust R867/R868 so that the meters indicate 0 dB.
2. Change the input level to −39 dB (8.69 mV) and adjust R869/R870 so that meters indicate −30 dB.
3. Repeat these two adjustments until the following requerements are obtained.
4. Set the input levels and check that the linearity at 0, −10, −20, −30 and −40 dB points on the meter scale are within the following limits for each level range.
   −5 dB to +5 dB = ±1 dB
   −20 dB to −6 dB + 2.5 dB
   −21 dB and over = ±3.0 dB

6-5-2 PEAK LEVEL METER CALIBRATION – PLAYBACK –

Specification: 0 dB (□□)

5. Load and play a TEAC MTT-150 test tape.
6. Set the MONITOR switch to the TAPE OUTPUT position.
7. Make sure that output from the deck is −5 dB (436 mV). If not, correct this by rotating the OUTPUT control.
8. Adjust R807/R808 so that the meter indicates 0 dB.
9. Change the MONITOR switch setting to CAL position and confirm that the meter also reads 0 dB.

6-6 RECORDING PERFORMANCE

NOTE: Before making any adjustments of the recording circuit, be sure that all tests in the above performance sections have been accomplished. PLAYBACK and MONITOR performance must be properly adjusted, otherwise record calibration will be inaccurate.

6-6-1 BIAS TRAP ADJUSTMENTS

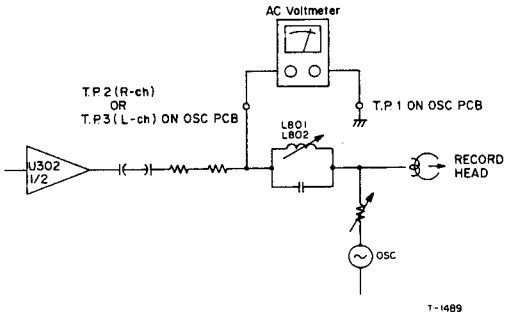


Fig. 6-10 Bias trap adjustment setup

NOTE: The AC voltmeter used in this procedure must have input impedance of 1M ohm or more.

1. Load a blank tape.
2. Place the deck in the RECORD-PAUSE mode with no signal applied.
3. Adjust L801/L802 for a minimum reading between the T.P.2 (for R-ch) or T.P.3 (for L-ch) and T.P.1 on the OSC PCB ass'y See Fig. 6-10.

6-6-2 RECORD BIAS SETTING ADJUSTMENT

CrO_2 tape

1. Connect the deck and the test equipments as shown in Fig. 6-9 on page 21.
2. Load a TEAC MTT-506 test tape.
3. Set the attenuator so that the input to the deck is –42 dB (6.15 mV).
4. Initially set the R865/R866 fully counter clockwise.
5. Record a 6.3 kHz test tone.
6. Turn R865/R866 slowly clockwise so that the output reading on the AC voltmeter rises slowly, reaches a peak, and then begin to decrease again. Set both trim pots for 1 dB beyond and below the peak level.
7. Then apply and record two tone signals in turn, a 400 Hz signal and a 15 kHz signal.
8. During simultaneous tape monitoring (playing), compare the output level of the 15 kHz signal with the level of the 400 Hz signal. Both signals should indicate almost the same level.
9. Adjust R865/R866 until this (#8) requirement is satisfied.
10. Then record an 18 kHz signal on the tape.
11. While watching the AC voltmeter, make fine adjusting by turning L307, of both L- and R-channels, so that the 18 kHz signal level satisfies the frequency response limits in Fig. 6-14.

FeCr and NORMAL tapes

12. Repeat the preceding procedure, with the following differences:

	FeCr tape	NORMAL tape
BIAS/EQ switches:	FeCr	NORMAL
Test tape:	MTT-504	MTT-501
Adjustment for BIAS:	R863/R864	R861/R862
Adjustment for freq. spec.:	L306	L305
Different freq. in step 10, 11:	18 kHz	16 kHz

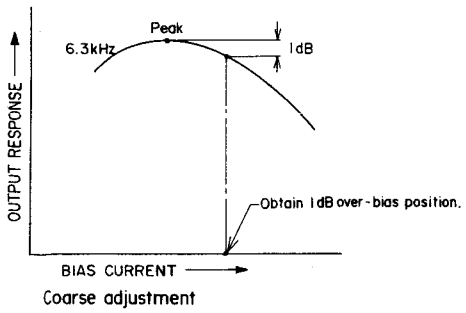


Fig. 6-11 Bias adjustment (coarse)

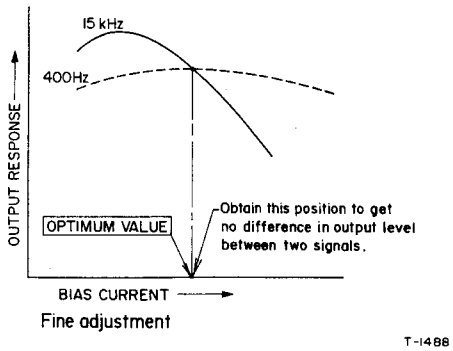


Fig. 6-12 Bias adjustment (fine)

6-6-3 RECORD LEVEL SETTING

CrO_2 tape

13. Set the BIAS/EQ switches to the CrO_2 position and load a TEAC MTT-150 test tape.
14. Play the tape and make sure that levels from OUTPUT jacks are –5 dB (436 mV).
15. Change tape MTT-506.
16. Apply and record a 400 Hz test signal at –12 dB (195 mV).
17. Then conduct simultaneous record/playback monitoring.
18. Adjust R364, of both L- and R-channels until the deck's output indicates –8 dB (308 mV).

FeCr and NORMAL tapes

19. Repeat the above procedures using the following substitutions.

	FeCr tape	NORMAL tape
BIAS/EQ switches:	FeCr	NORMAL
Test tapes:	MTT-504	MTT-501
Adjustments:	R366	R367

6-6-4 DISTORTION CHECKS

Specifications:

2.0% or less (with all kinds of tape)

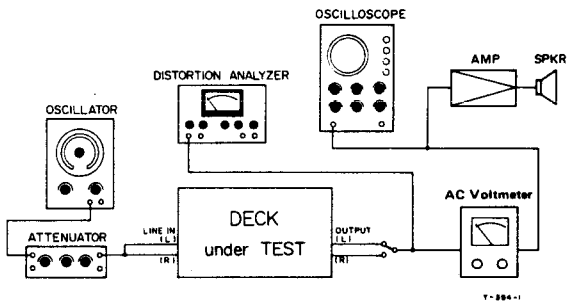


Fig. 6-13 Connection

CrO_2 tape

1. Load a TEAC MTT-506 test tape.
2. Apply and record a 400 Hz test tone at –12 dB (195 mV).
3. Rewind and play this recorded section.
4. Read the indicated value on the distortion analyzer.

FeCr and NORMAL tapes

5. Repeat the above "CrO_2 tape" procedure for FeCr and NORMAL tapes with the following exceptions.

	FeCr tape	NORMAL tape
BIAS/EQ switches:	FeCr position	NORMAL position
Test tape:	MTT-504	MTT-501

6-6-5 FREQUENCY RESPONSE – OVERALL –

CrO_2 tape

1. Connect the deck and the test equipments as shown in Fig. 6-9.
2. Load a TEAC MTT-506 test tape.
3. Apply and record a test signal required in the Fig. 6-14, at –42 dB (6.15 mV).
4. With the simultaneous record/playback function, make sure the readings on the AC voltmeter are within the response limits.
5. In case of any deviation in the high frequency range of the response limits, clean the heads and do again the L307 setting described in step 11 in paragraph 6-6-2.

FeCr and NORMAL tapes

6. Repeat the above procedure, with the following exceptions.

	FeCr tape	NORMAL tape
BIAS/EQ switches:	FeCr position	NORMAL position
Test tape:	MTT-504	MTT-501
Chart:	Fig. 6-15	Fig. 6-16
Adjustment:	L306	L305

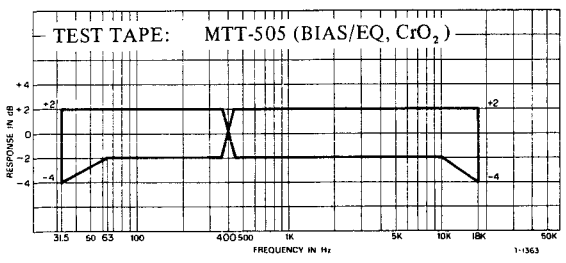


Fig. 6-14 Overall frequency response limits (1)

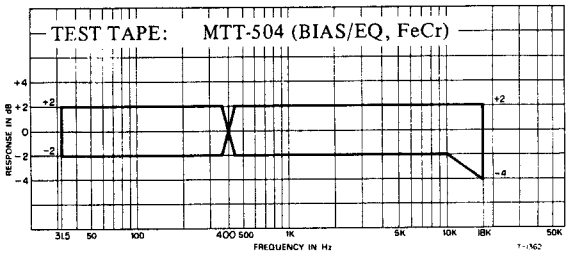


Fig. 6-15 Overall frequency response limits (2)

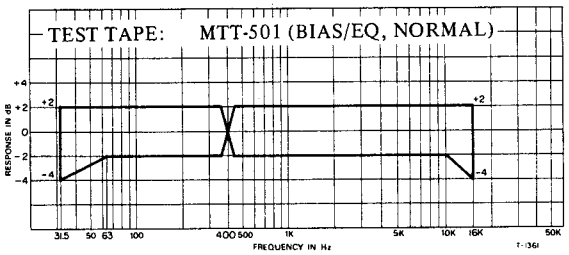


Fig. 6-16 Overall frequency response limits (3)

6-6-6 SIGNAL TO NOISE RATIO – OVERALL –

Specifications:

CrO_2 and FeCr tapes:	48 dB (min.) (UNWTD)
	54 dB (min.) (WTD)
NORMAL tape:	45 dB (min.) (UNWTD)
	51 dB (min.) (WTD)

CrO_2 tape

1. Connect the deck and the test equipment as shown in Fig. 6-9.
2. Initially make sure that deck is set in specified recording and playback condition.
3. Load the TEAC MTT-506 test tape.
4. Apply and record specified input level of –9 dB (275 mV) of 1 kHz signal for several seconds.
5. Then continue recording with no signal applied for a few seconds.
6. Rewind the tape to the beginning of the 1 kHz signal recorded portion.
7. Play and obtain the output level difference between the 1 kHz signal recorded portion and no signal recorded portion.

FeCr and NORMAL tapes

8. Repeat the preceding procedures using the following substitutions.

	FeCr tape	NORMAL tape
BIAS/EQ switches:	FeCr position	NORMAL position
Test tape:	MTT-504	MTT-501

6-6-7 ERASE EFFICIENCY

Specification: 65 dB (min.)

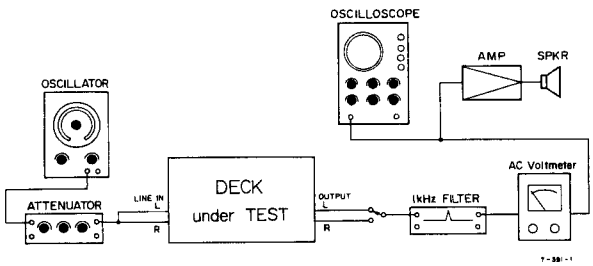


Fig. 6-17 Connection

NOTE: To measure erase efficiency, a 1 kHz narrow bandpass filter should be used. The test signal delivered from the AF oscillator should be tuned to the filter used.

Numbers in parentheses correspond to steps in Fig. 6-18.

1. Load a TEAC MTT-506 test tape.
2. Apply and record a 1 kHz signal at +1 dB (0.869 V, saturation level) for several seconds . . . . . (1)
3. Rewind the tape to the mid-point of the recording and remove the signal from the LINE IN jacks . . . . . (2)
4. Place the deck in the record mode and record through this previously recorded portion with no input signal applied. . . . . (3)
5. Rewind the tape to the starting point of the 1 kHz signal recorded portion . . . . . (4)
6. Play the tape and read the indication on the AC voltmeter to obtain the output level of both the unerased portion and the erased portion of the recorded section . . . . . (5)
7. Measure the output level differences between the 2 portions.

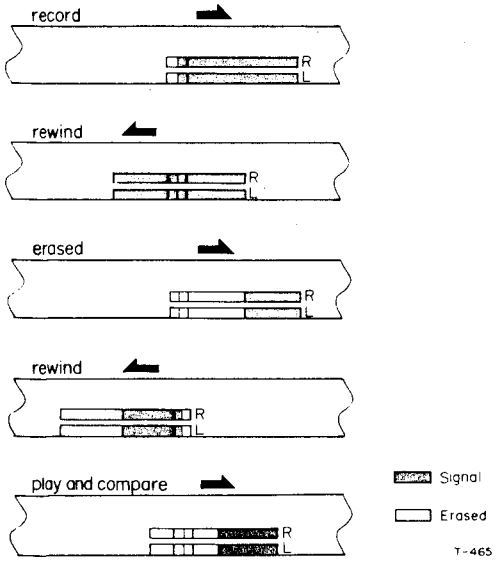


Fig. 6-18 Erase efficienty check procedure

6-6-8 CHANNEL SEPARATION

Specification: 35 dB (min.)

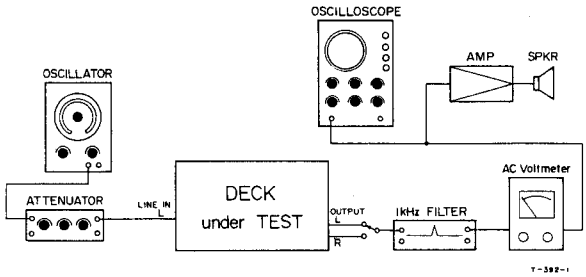


Fig. 6-19 Connection

NOTE: To check channel separation (cross talk between channels), a 1 kHz narrow bandpass filter should be used. The test signal delivered from an AF oscillator should be tuned to the filter used.

Numbers in parentheses correspond to steps in Fig. 6-20.

1. Load a TEAC MTT-506 test tape.
2. Apply a 1 kHz test-tone at –9 dB (274 mV) into the left channel.
3. Place the deck in the record mode for about 30 seconds. . . . . (1)
4. Rewind the tape to the starting point of recording. . . . . (2)
5. Play the tape and measure the output level differences between the left and right channels. . . . . (3)

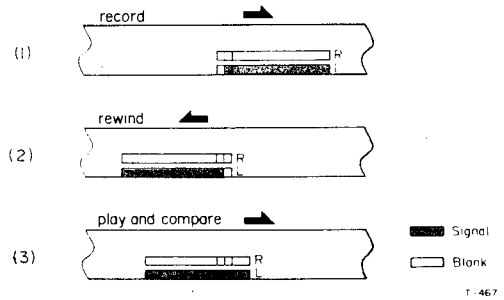


Fig. 6-20 Channel separation check procedure

6-6-9 ADJACENT TRACK CROSSTALK MEASUREMENT

Specification: 40 dB (min.)

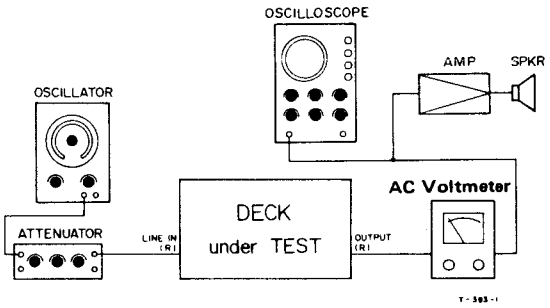


Fig. 6-21 Connection

NOTE: The tape must be completely erased prior to this procedure. Preferably use bulk erased tape.

Numbers in parentheses correspond to steps in Fig. 6-22.

1. Load TEAC MTT-506 test tape.
2. Apply a 125 Hz test signal at –9 dB (274 mV).
3. Place the deck in the record mode for about 30 seconds. . . . . (1)
4. Rewind the tape to the starting point of recording. . . . . (2)
5. Play the tape and measure the output level of the recorded portion. Note this reading for temporary reference level for the following measurements . . . . . (3)
6. Remove the test tape, turn it over and replace it in the deck. . . . . (4)
7. Play the tape back and read the output level. . . . . (5)
8. Get the difference between this reading and the reading previously measured for the 125 Hz signal.

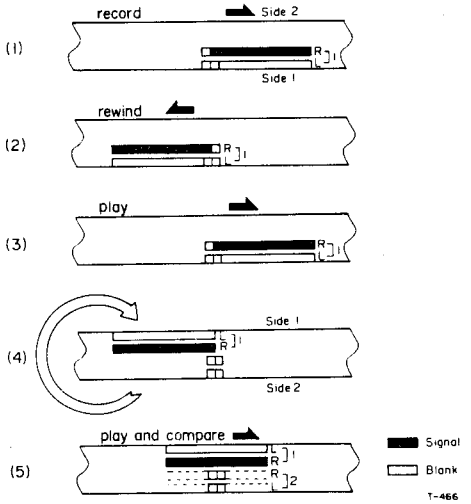


Fig. 6-22 Adjacent track crosstalk measurement procedure

6-6-10 REC MUTE FUNCTION CHECK

Specification:

Difference between specific recorded portion and erased internal portion: 65 dB (min.)

NOTE: For this check, a 1 kHz narrow bandpass filter should be used. The test signal delivered from the AF oscillator should be tuned to the filter used.

1. Connect the deck and the test equipment as shown in Fig. 6-9.
2. Load TEAC MTT-506 test tape.
3. Apply and record a 1 kHz signal at +1 dB (0.869 mV) for several seconds.
4. Push the REC MUTE button so that it will cause the tape to run with no incoming signal recording for several seconds.
5. Push the forward button again to make normal recording for a short duration.
6. Rewind the tape to the original starting point of the 1 kHz signal recorded portion.
7. Play the tape and obtain the output level of both the recorded portion and the created no signal portion.
8. Measure the output level difference between the portions.
9. A 65 dB difference or more is required.

6-6-11 DOLBY NR EFFECT MEASUREMENT

Specifications:

Variation from reference at 1 kHz: 4 dB to 7 dB
Variation from reference at 10 kHz: 8 dB to 12 dB

(1) 1 kHz recorded w/NR SYSTEM in OUT

1. Connect the deck and the test equipment as shown in Fig. 6-9.
2. Make sure that the NR SYSTEM switch is set in the OUT position.
3. Load a TEAC MTT-506 test tape.
4. Apply and record a 1 kHz signal at –29 dB (27.5 mV).
5. Rewind and play this recorded section.
6. While playing the 1 kHz signal, read the indication of the output level on the AC voltmeter with the NR SYSTEM switch at OUT and DOLBY (DD mark) positions.
7. The output level in the DOLBY position should be 4 dB to 7 dB lower than the OUT position.

(2) 1 kHz recorded with NR SYTEM set to OUT and DOLBY positions.

8. Repeat the above procedure, but record with NR SYSTEM switch in OUT then DOLBY positions, and measure in OUT position. Specification is the same as that of item (1).

(3) 10 kHz recorded with the NR SYSTEM in the OUT position.

9. Repeat the above (1) procedure changing the applied test signal to 10 kHz at –39 dB (8.69 mV).
10. The output level in the DOLBY position should be 8 dB to 12 dB lower than in the OUT position.

(4) 10 kHz recorded with the NR SYSTEM switch in both OUT and DOLBY positions.

11. Conduct the (2) procedure changing the test signal to 10 kHz at –39. dB. Specification is the same as that for item (3).

6-7 ADJUSTMENT AND TEST POINT LOCATIONS

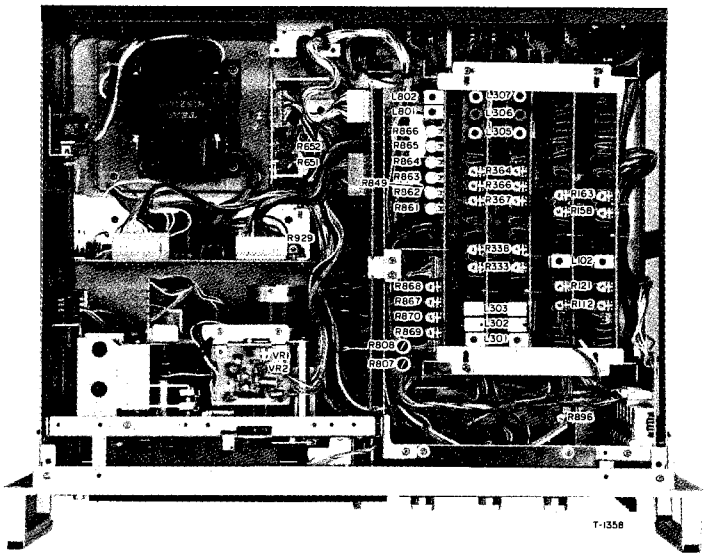


Fig. 6-23 Adjustment location

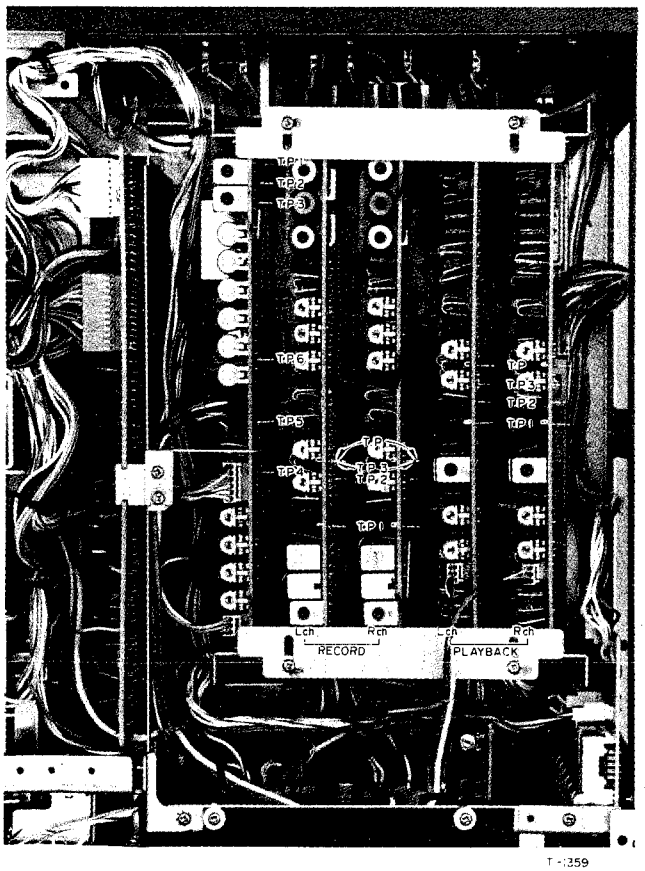


Fig. 6-24 Test point location

R112/R112	Playback equalization
R121/R121	Playback level adjustment
R158/R158	Dolby encoder (LOW)
R163/R163	Dolby encoder (GAIN)
R333/R333	Dolby decoder (LOW)
R338/R338	Dolby decoder (GAIN)
R364/R364	Record level adjustment (CrO_2)
R366/R366	Record level adjustment (FeCr)
R367/R367	Record level adjustment (NORMAL)
R651	Supply reel motor torque adjustment
R652	Take-up reel motor torque adjustment
R807/R808	Peak level meter adjustment (playback)
R849	Oscillator power supply voltage adjustment
R861/R862	Bias adjustment (NORMAL)
R863/R864	Bias adjustment (FeCr)
R865/R866	Bias adjustment (CrO_2)
R867/R868	Peak level meter adjustment (monitor)
R869/R870	Peak level meter adjustment (monitor)
R896	Output level balance (R channel)
R929	+15 V adjustment
VR1	Tape speed (PITCH CONT, ON)
VR2	Tape speed (PITCH CONT, OFF)
L102/L102	Bias trap (playback)
L301/L301	Bias trap (record, input)
L303/L303	MPX filter
L305/L305	Record equalization (NORMAL)
L306/L306	Record equalization (FeCr)
L307/L307	Record equalization (CrO_2)
L801/L802	Bias trap (record, output)

7. BLOCK DIAGRAM

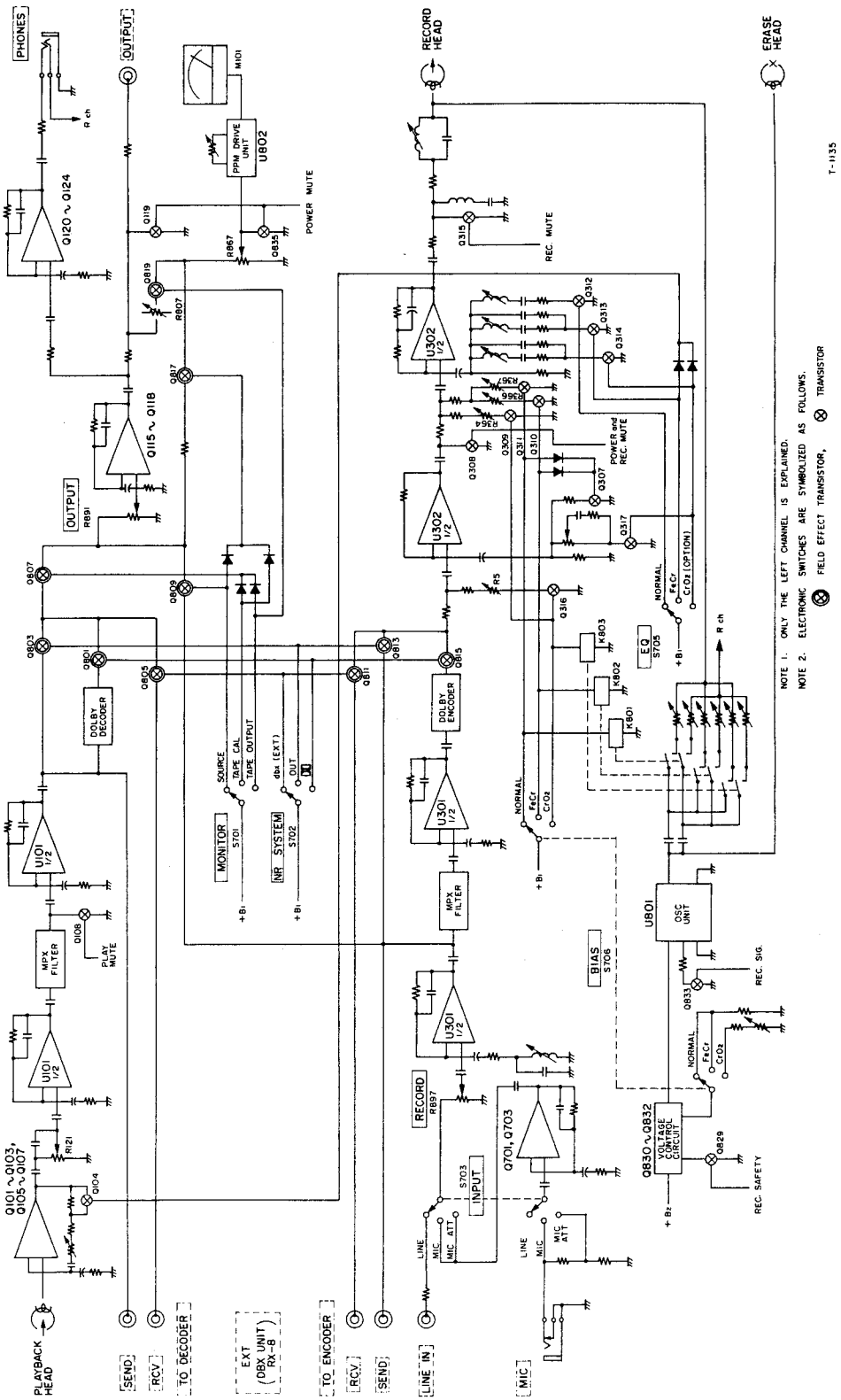
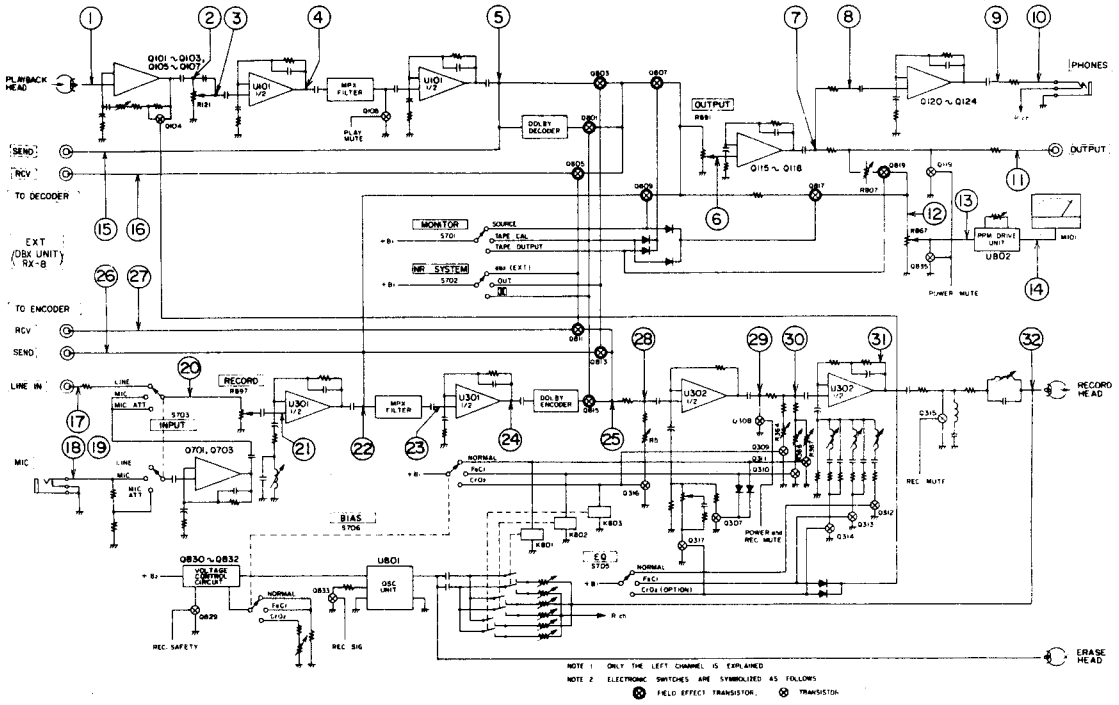


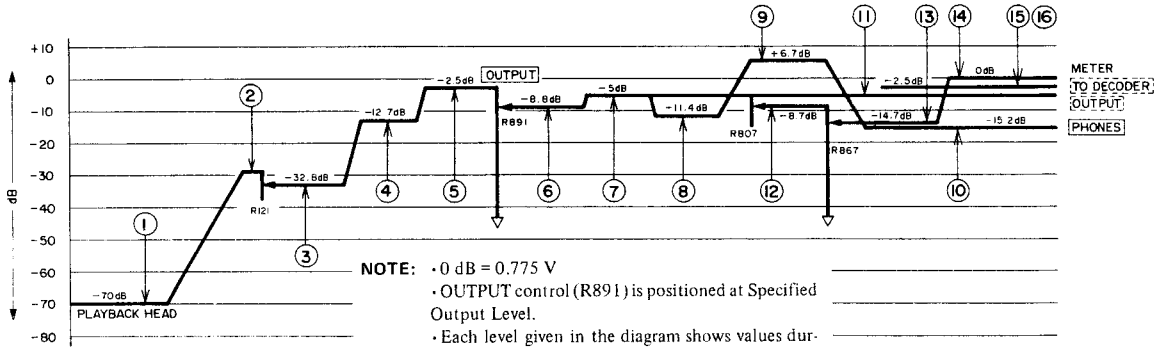
Fig. 7-1

NOTE: REF Nos. shown in the diagram relate only to the left channel.

8. LEVEL DIAGRAM

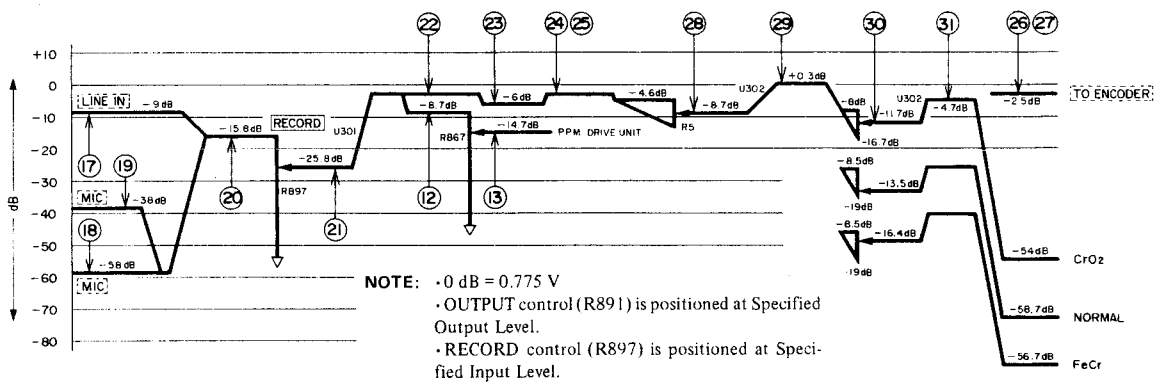


PLAYBACK SYSTEM



NOTE:
- 0 dB = 0.775 V
- OUTPUT control (R891) is positioned at Specified Output Level.
- Each level given in the diagram shows values during playback with MTT-150 Test Tape (Dolby tone).

RECORDING SYSTEM



NOTE:
- 0 dB = 0.775 V
- OUTPUT control (R891) is positioned at Specified Output Level.
- RECORD control (R897) is positioned at Specified Input Level.
- Each level given in the diagram shows values when a 400 Hz Specified Input Level is applied.

Fig. 8-1

9. VOLTAGE AND FREQUENCY SETTING

9-1 VOLTAGE SELECTOR SETTING PROCEDURE (FOR GENERAL EXPORT MODELS)

1. Disconnect the power cord of the deck from the source.
2. Remove the deck cover by removing two screws on each side and two screws on the top. Locate the voltage selector near the transformer inside the deck.
3. To increase the selected voltage, turn the slotted center post clockwise using a screwdriver or other suitable tool.
4. To decrease the selected voltage, turn the slotted center post counterclockwise.
5. The numerals that appear in the cut-out window of the voltage selector indicate the selected voltage.

9-2 AC POWER LINE FREQUENCY ADAPTATION

For cassette deck models with DC Capstan and Reel Motors, no modification is required for change of power line frequency from 60 Hz to 50 Hz and vice versa.

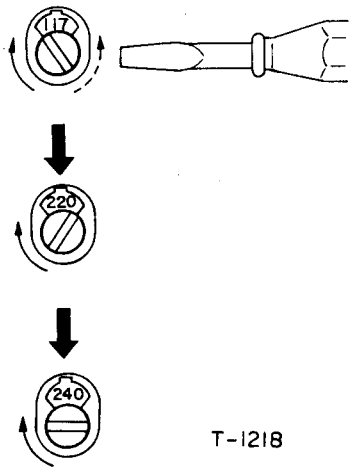


Fig. 9-1 Voltage frequency setting

MEMO

TEAC

C-1 Stereo Cassette Deck with Dolby System

TEAC

TEAC CORPORATION 3-7-3 NAKA-CHO MUSASHINO TOKYO PHONE (0422) 53-1111

TEAC CORPORATION OF AMERICA 7733 TELEGRAPH ROAD MONTEBELLO CALIFORNIA 90640 PHONE (213) 726-0303

TEAC AUSTRALIA PTY., LTD. 165-167 GLADSTONE STREET SOUTH MELBOURNE VICTORIA 3205 PHONE 699-6000

PRINTED IN JAPAN 1178 SYU 2.0 D-2982A

TEAC®

CIRCUIT DESCRIPTION

C-1

Stereo Cassette Deck with Dolby System

TEAC CORPORATION

51032550

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* Noise reduction circuit made under license from Dolby Laboratories. The word "Dolby" and the Double-D symbol are trademarks of Dolby Laboratories.

TAPE TRANSPORT SECTION

The system control section of C-1 employs an LSI (large scale integrated circuit).
This section also features several newly developed circuits to maximize the performance of the dual captsan system. Specifically, the tape loading circuit which automatically pulls in the slack of a tape when a cassette is loaded, the tape speed control circuit to run the tape at a constant speed in the fast forward mode, the electromagnetic reel motor brake circuit, and so on.
Features and operation of the tape transport section are described in this manual. Voltage values, waveforms, delay times and other values used in the description are for your reference, and may change depending on the parts used, power supply voltage and other factors.
Unless otherwise specified, the initial state referred to in the description means the STOP mode.

1. SYSTEM CONTROL LSI

1-1 INTRODUCTION

The system control section of C-1 employs a 24-pin dual in line P-channel MOS LSI. This LSI is specially designed as a system control circuit on the basis of studies made of the functions of many conventional tape decks. The block diagram of the LSI is shown in Fig. 1.
The LSI includes an input priority circuit, an operational memory, a timing control circuit, etc.
The LSI is operated by one +10V to +16V DC power supply. All operations of the LSI are synchronized by an external clock signal. Functions of the LSI cover almost all controls of the tape deck including REC, REC MUTE, REC SAFE, STOP, STAND-BY (PAUSE), REVERSE, F. FWD, REWIND, REVIEW (CUE), RESET and WAIT.
Tape deck controls will be different in different models even if the same LSI is used. Therefore, connections and input/output combination must be changed in different models.
Unused functions in the C-1 are omitted from this description. Both input and output of the LSI use HIGH=TRUE for the C-1. That is, the command signal for a given operation is input at the high level, and the output signal from the LSI necessary for that operation is also at the high level. All outputs are open drain and thus all terminals in use must be grounded to V_{DD} (GND) by means of a resistor. The LSI is refered to as the SYS-CON in the following paragraphs.

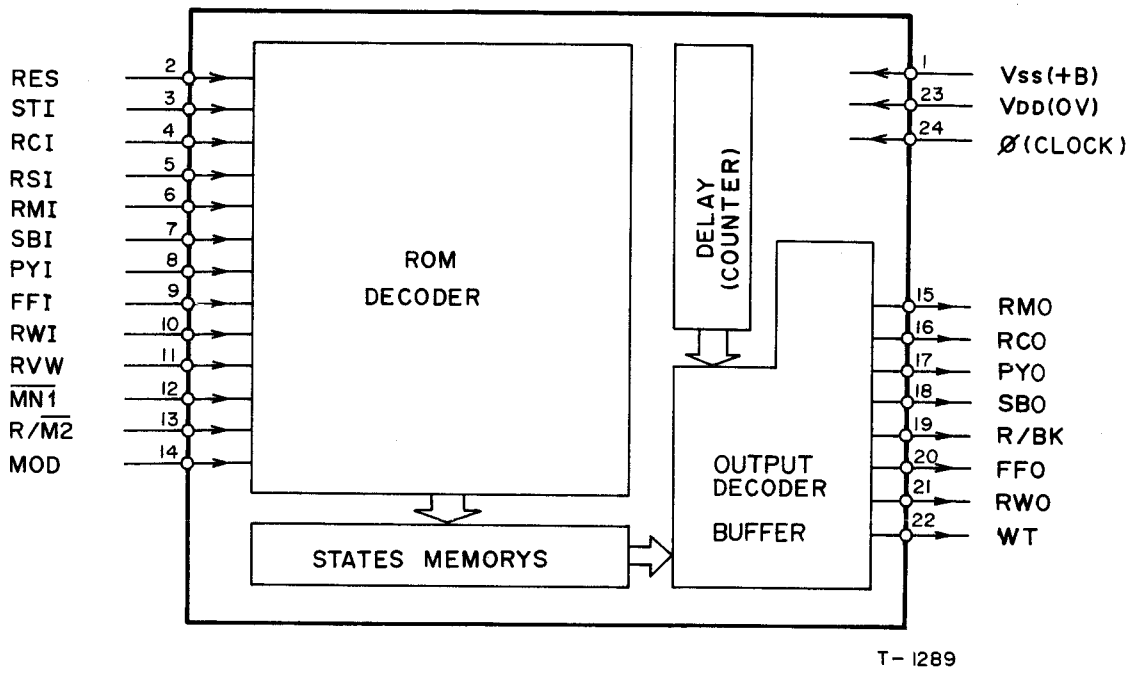


Fig. 1 LSI Block Diagram

TAPE TRANSPORT SECTION

1-2 INPUT-OUTPUT CONDITIONS AND TERMINALS

Refer to Fig. 2.

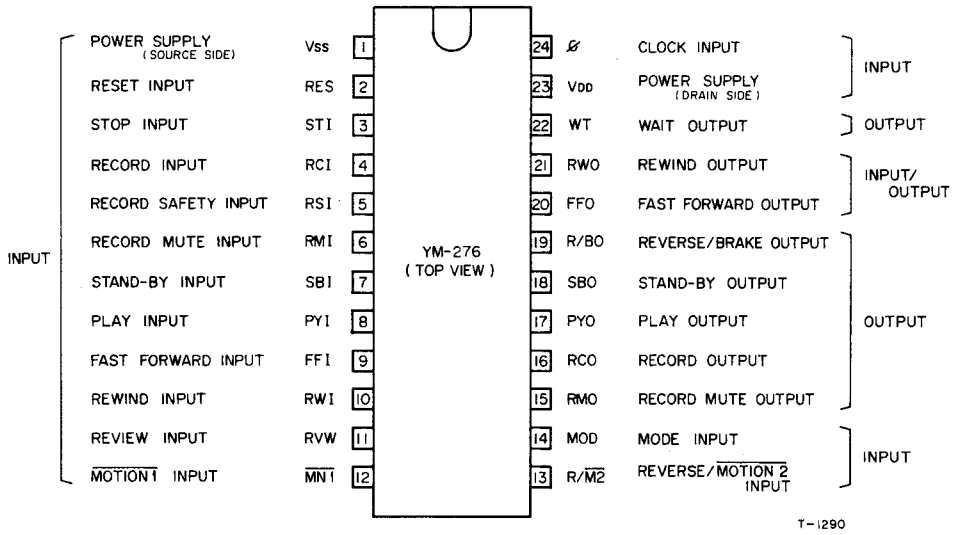


Fig. 2 LSI Input/Output Terminals

Pin 1: Power supply terminal

When VDD is zero volt, the recommendable operating condition of Vss is such that Vss = +10V ∿ +16V. Vss is 12V in the C-1. Vss ripple must be under 100mVp-p.

Pin 2 ∿ 14, 24: Input terminals

Input high and low levels are given in Fig. 4.

As can be seen from Fig. 4, the high level range is extremely narrow. Thus, when a diode logic circuit is used in conjunction with the input circuit, the voltage drop in the doide must be taken into consideration. D504 is used to conpensate for the voltage drop due to D501 to D503, D505, D505, etc. The input circuit from the operation switch to the LSI is as shown in Fig. 5.

The integrating circuit comprising R1 and C1 eliminates high frequency noise. When the input to the LSI is at the high level, the current flowing into the LSI is as low as about 10 μA. If the insulation resistance between the high level terminal and adjacent terminals falls due to dust or moisture, current may leak into the LSI and actuate it accidentally. To prevent this, R2 (10K) is provided in the LSI to ground leakage current if it is present.

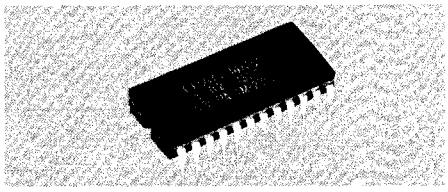


Fig. 3 LSI Outside View

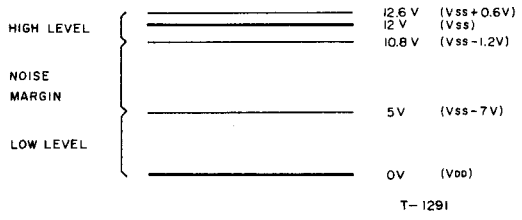


Fig. 4 Input Signal Logic Level

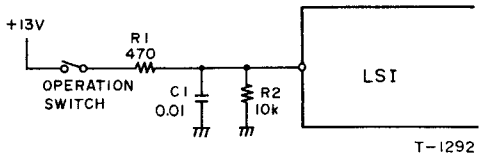


Fig. 5 Switch Input Circuit

TAPE TRANSPORT SECTION

Pin 11, 13:
These input terminals are grounded to hold them low, because the REW function is not provided in the C-1.

Pin 12, 14:
These pins are grounded and therefore at low level. If the PAUSE button or the PLAY button is depressed in the F. FWD mode or the REW mode in this condition, FFO or RWO falls to the level while SBO or PYO goes high.

Pin 15 ∿ 18, 20 and 21: Output Terminal
All output terminals of the LSI are open drain. Signals are output at the high level. The output voltage is Vss −1V when the output current is 5mA. The LSI of C-1 is designed so that all load currents are kept below 25 mA. Therefore, the output voltage is higher than +11V.

Pin 19, 22:
These two output terminals are unused.

Pin 23: GND terminal

Pin 24: Clock input terminal
A clock signal of 40 to 50 kHz is required to operate the SYS-CON. If this clock signal is not generated correctly, all of the C-1 operations are not ensured. Q504 and Q505 comprise the clock oscillator. The oscillation frquency is about 45 kHz.

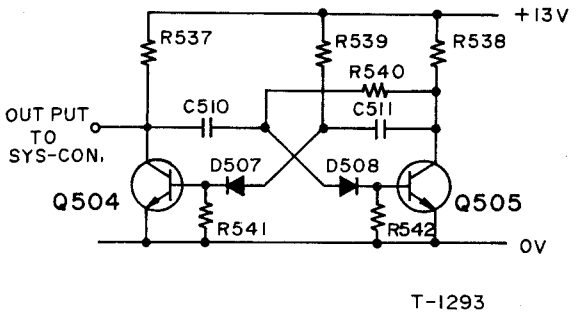


Fig. 6 Clock Signal Oscillator

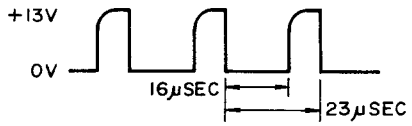


Fig. 7 Clock Signal Waveform

1-3 OPERATION

(1) Input priority
The input priority of the signals is predetermined. If two or more signals are input simultaneously, the output is determined according to the priority of the input signals. Input signal priority is as follows (from higher priority to lower).

(1) RES (RESET) (2) STI (STOP) (3) SBI (PAUSE) (4) PYI (PLAY) (5) REVERSE (unused in C-1) (6) FFI (F. FWD), RWI (REW)

For example, if the STOP button and the PLAY button are depressed at the same time, the SYS-CON outputs the STOP signal according to the input signal priority, and the tape deck is set in the STOP mode.

Note that when two buttons are released at the same time, the operation mode of the button which is released later is selected. FFI and RWI both have the same priority. When the F. FWD button and the REW button are depressed at the same time, both FFO and RWO signals are output. In this case, the REWIND mode is selected in C-1 by the reel motor control circuit.

(2) Record delay operation
When the operation is changed over from REC/PLAY or REC/PAUSE mode to STOP, F. FWD or REW mode, SBO or PYO falls to the low level about 45 milliseconds after RCO (when the clock frequency ≒ 45 kHz). FFO or RWO rises to the high level after SBO or PYO falls to the low level. This time delay runs the tape until the recording bias has stopped after completion of the recording operation. A click may be recorded if the tape is removed from the recording head while the recording bias is still effective. The time delay results from dividing the clock signal frequency. Therefore, the delay time becomes shorter if the clock signal frequency is high, and it becomes longer if the frequency is low.

TAPE TRANSPORT SECTION

1-4 OUTPUT SIGNAL GENERATING CONDITIONS

Conditions for generating output signal are described in (1). Conditions for setting and resetting the operational memory in the SYS-CON are described in (2). Resetting has priority over all other operations in the SYS-CON. Therefore, even if a set condition exists, the corresponding memory will not be set if a reset conditions exists.
Signs used in (1) and (2) are as follows, except for those indicated in Fig. 2.

F (** are numerals)**: Flip-flops functioning as memories.
S, R****: Confitions for setting and resetting F**.
Q**: Output of F** which rises to the high level when F** is set.
DL: Delay. This condition is established when the delay time described in the paragraph 1.3, (2) elapses.
All formulas established in the SYS-CON are expressed by logical equations of AND and OR.
" . " means AND " + " means OR

(Example)

RCO = Q01
S01 = RCI . (PYI + SBI)

The above equations means:
RCO (record output terminal, pin 16) of the SYS-CON goes high when Q01 is high. Q01 goes high when the REC operation memory FϕI is set. F01 is set when the set condition S01 is established. S01 is established when RCI is high and PYI or SBI is high. That is, FϕI is set when the REC button is depressed together with the PLAY or PAUSE button, and the output Q01 goes high and thus RCO goes high so the REC operation signal is output.
The bar "–" in $\overline{\text{PYI}}$ and $\overline{\text{RES}}$ means the low level, and each of these signs indicates the condition where the PLAY button is not depressed, and the condition where no reset signal exists.
In the logical formulas in (1) and (2), the first equation line out of two lines is the general equation of the SYS-CON. The second line is the equation applied to the C-1. Since pins 11 to 14 of the SYS-CON are grounded in C-1, input signals of RVW, $\overline{\text{MN1}}$, R/$\overline{\text{M2}}$ and MOD are usually at the low level. If the general equation is modified taking account of this fact, it becomes the same as the equation for C-1.

(1) Output

RCO = Q01
PYO = Q02 + DL . Q10
SBO = Q03 + DL . $\overline{\text{Q10}}$
FFO = (Q05 + S05) . $\overline{\text{DL}}$ + Q08 . $\overline{\text{R/M2}}$
= (Q05 + S05) . $\overline{\text{DL}}$ (C – 1)
RWO = (Q06 + S06 + Q11) . $\overline{\text{DL}}$ + Q08 . MN1
= (Q06 + S06) . $\overline{\text{DL}}$ (C – 1)
RMO = Q07

(2) Conditions for setting and resetting operation memories (status memories) in the SYS-CON

F01: REC operation memory
S01 = RCI . (PYI + SBI)
R01 = RES + STI + FFI + RWI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$ + RSI
= RES + STI + FFI + RWI + RSI (C – 1)

F02: PLAY operation memory
S02 = PYI
R02 = RES + STI + SBI + $\overline{\text{PYI}}$. (FFI + RWI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$)
= RES + STI + SBI + $\overline{\text{PYI}}$. (FFI + RWI) (C – 1)

F03: STAND-BY (PAUSE) operation memory
S03 = SBI
R03 = RES + STI + $\overline{\text{SBI}}$. (PYI + FFI + RWI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$)
= RES + STI + $\overline{\text{SBI}}$.(PYI + FFI + RWI)(C – 1)

F04: Omitted

F05: FAST FORWARD operation memory
S05 = FFI . $\overline{\text{RES}}$. $\overline{\text{STI}}$. $\overline{\text{SBI}}$. $\overline{\text{PYI}}$. $\overline{\text{R/M2 . MOD}}$
= FFI . $\overline{\text{RES}}$. $\overline{\text{STI}}$. $\overline{\text{SBI}}$. $\overline{\text{PYI}}$ (C – 1)
R05 = RES + STI + RWI + (MNI + $\overline{\text{R/M2}}$. MOD) . (SBI + PYI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$)
= RES + STI + RWI + SBI + PYI C – 1)

F06: REWIND operation memory
S06 = RWI . $\overline{\text{RES}}$. $\overline{\text{STI}}$. $\overline{\text{SBI}}$. $\overline{\text{PYI}}$. $\overline{\text{R/M2 . MOD}}$
= RWI . $\overline{\text{RES}}$. $\overline{\text{STI}}$. $\overline{\text{SBI}}$. $\overline{\text{PYI}}$ (C – 1)
R06 = RES + STI + FFI + (MNI + $\overline{\text{R/M2}}$. MOD) (SBI + PYI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$)
= RES + STI + FFI + SBI + PYI

F07: RECORD MUTE operation memory.
S07 = RMI . Q01 . Q02
R07 = RES + STI + SBI + PYI + FFI + RWI + RSI + R/$\overline{\text{M2}}$. $\overline{\text{MOD}}$
= RES + STI + SBI + PYI + FFI + RWI + RSI (C – 1)

F08, F09: Omitted

F10: RECORD DELAY operation memory.
S10 = Q01 . Q02
R10 = Q01 . Q03

F11: Omitted

TAPE TRANSPORT SECTION

2. CONTROL P.C.B.

2-1 INITIAL POWER RESET CIRCUIT

The initial power reset circuit is provided to prevent the SYS-CON from being operated mistakenly by transient phenomena which takes place when the power switch of C-1 is turned on. (Refer to Fig. 8)

When the power switch of the tape deck is turned on, the regulator on the power supply PCB operates and 13V DC is supplied to the control PCB. At the same time, current flows in C517 via route (1) and charges it and then Q517 turns on. Then, the base current of Q516 flows in route (2) and Q516 also turns on and supplies a high level reset signal to the SYS-CON in the route (3).

This reset signal resets operation memories and counters in the SYS-CON.

After C517 has discharged, Q517 and Q516 turn off and the reset signal supply is stopped. The reset signal is issued for about one (1) second after the power switch is turned on. When the power switch is turned off, C517 is rapidly discharged and prepares for the next turning on of the power switch. When the power switch is turned on with no cassette loaded in the tape deck, Q516 is turned on continuously by the current in route (5) and SYS–CON is left in the reset status. The reset status is released by loading a cassette. If the power supply voltage of the control circuit fluctuates, unnecessary operations may take place owing to different charging and discharging time constants or the threshold voltage of circuits driving solenoids and LEDs. To prevent such unnecessary operation, the circuit comprising D539, Q514 and Q515 keeps inputs of these drive circuits at a low level when the power supply voltage is too low. When the power supply voltage is below about 8V, Q514 turns off and Q515 turns off so they inhibit operation of the drive circuits so that solenoids and LEDs are not turned on.

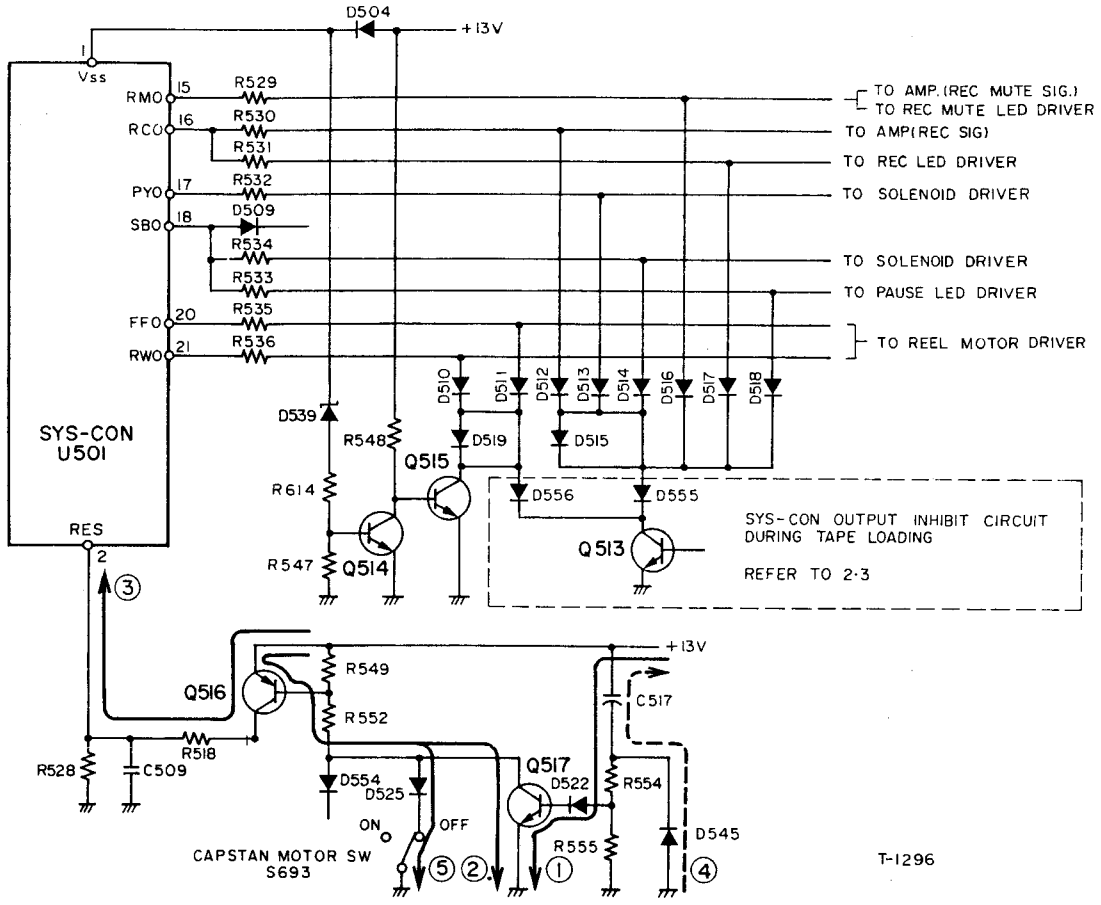


Fig. 8 Initial Power Reset Circuit

TAPE TRANSPORT SECTION

2-2 SOLENOID DRIVE CIRCUIT

Three solenoids are incorporated in the C-1. Their functions are as follows:

Head Solenoid - Pulls the erase and R/P heads into the cassette, so as to make contact with the tape. It also pulls the pinch roller to the pause position.

Brake solenoid - Removes the brake from the reel table.

Pinch solenoid - Pushes the pinch roller into contact with the captsan shaft to run the tape.

Notes:

Each of the above solenoids is actuated by a relatively high voltage (+24V) and then maintained at a lower voltage (+10V).

This two-stage solenoid operating system applies a greater motivating force to the solenoid plunger when it is first activated, but maintains the solenid in operation at a lower voltage so as to prevent unnecessary temperature rise in the solenoid. The maximum voltage applied to the solenoids for extended periods is limited to 12V.

*　　*　　*

Operation of the solenoid drive circuits are described in the PLAY and PAUSE modes as an example.

Refer to Fig. 9. In the STOP mode, both pins 17 and 18 of U501 (SYS-CON) are at the low level, and each part of the circuit is in the following state.

Q522, Q531	OFF →	Head solenoid OFF C521 is charged.
Q523, Q532	OFF →	Brake solenoid OFF C522 is charged.
Q524, Q525, Q534	ON →	Potencial at the point (A) approx. +33V
Q526	ON	
Q527, Q533	OFF →	Pinch solenoid OFF C532 is charged.
Q529, Q530, Q535	ON →	Potencial at the point (B) approx. +33V

In the PLAY mode, a high level signal is output from pin 17 of U501. Q522 and 531 are turned on by the current in route (1). Q523 and Q532 are turned on by the current in

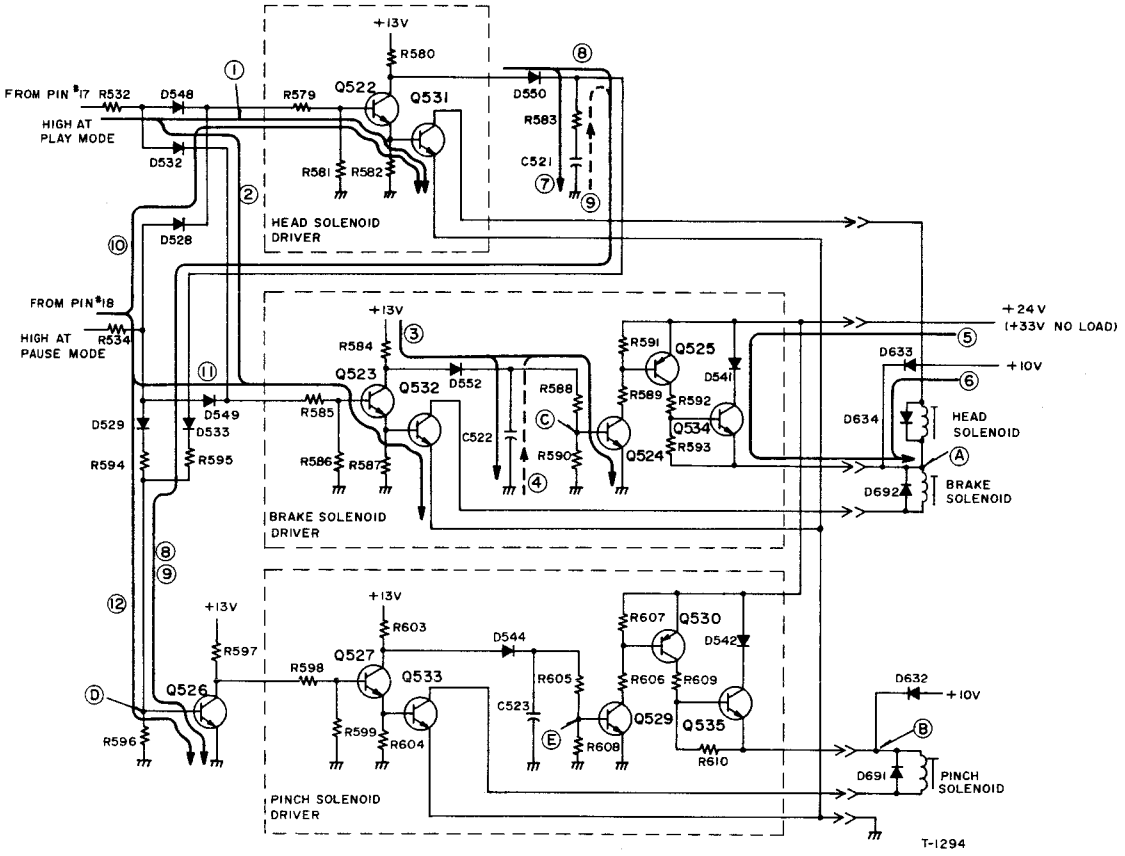


Fig. 9 Solenoid Drive Circuit

TAPE TRANSPORT SECTION

route (2). The head solenoid operates when Q531 is turned on. The brake solenoid operates when Q532 is turned on. When current flows in the solenoid, the potential at point (A) falls to about +24V.

When Q523 is turned on, the current in the route (3), which charges C522 and turns on Q524, is interrupted.

Thus, the charge in C522 is discharged via route (4). After C522 has discharged, Q524 turns off and then Q525 and Q534 also turn off.

When Q534 turns off, the high voltage supply to solenoids in the route (5) stops, and the solenoids are maintained at a low voltage by route (6) (about +10V).

Solenoids are supplied +24V for about 200 milliseconds.

When Q522 is off in the STOP mode, C521 is charged via route (7) and Q526 is turned on by the current in route (8). When Q522 turns on, current in routes (7) and (8) is interrupted and the charge in C521 is dischraged through route (9).

After C521 has discharged, Q526 turns off and then Q527 turns on and then Q533 turns on, and the pinch solenoid operates.

Owing to the discharge of C521, the pinch solenoid is actuated about 150 milliseconds after the head and brake solenoids. This time delay is to take in the slack in the tape to stabilize the tape transport.

(The status during the 150 milliseconds from actuation of the brake and head solenoids to that of the pinch solenoid is the same as in the PAUSE mode. In the PAUSE mode, weak current flows in both the right and left reel motors to pull in the slack in the tape. Details are given in the Section 4. (3).)

If the PAUSE button is depressed during the PLAY mode, the pin 17 of U501 goes low while pin 18 goes high.

Head and brake solenoids are kept in the operation status by current in route (10) and (11) respectively.

The pinch solenoid is turned off because Q526 is turned on by the current in route (12) and then Q527 and Q533 are turned off. As a result, the tape is not driven any more and stops running. When such a condition occurs, weak current flows in the right and left reel motors to tighten the tape as previously described.

The above operations are shown in the timing chart Fig. 10.

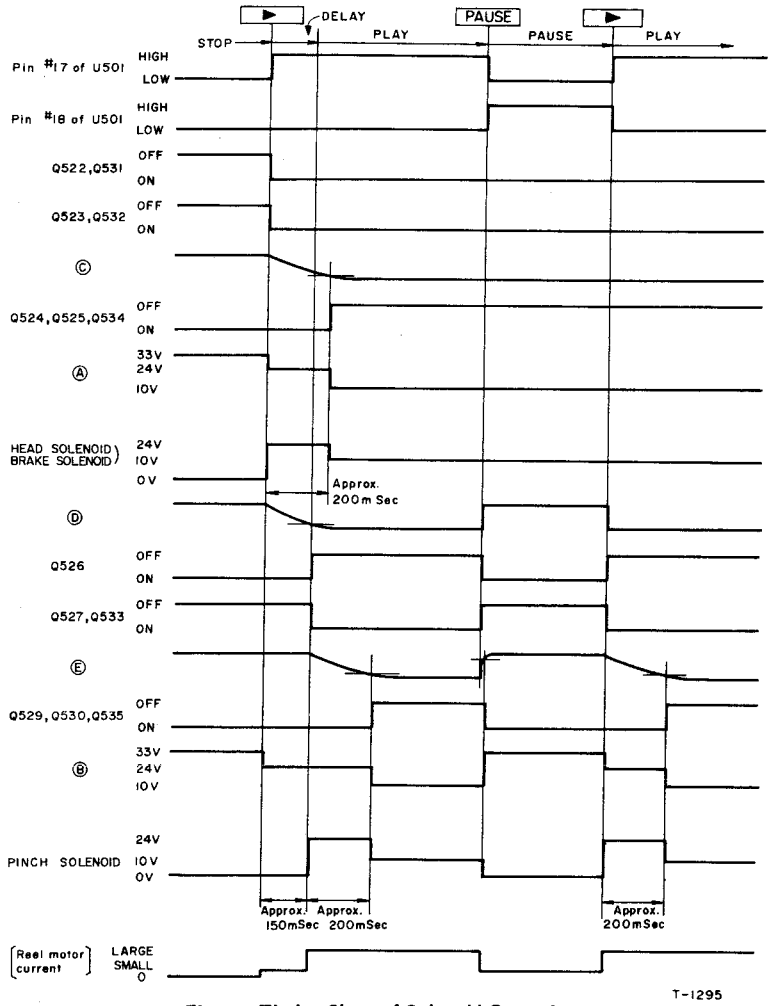


Fig. 10 Timing Chart of Solenoid Operation

TAPE TRANSPORT SECTION

2-3 TAPE LOADING CIRCUIT

C-1 adopts the dual capstan drive system. If a cassette tape is slack, it may cause intermittent sound or level fluctuation, or even disable recording or playback. To prevent this, a circuit which automatically pull the slack in the tape is provided. This circuit operates when a cassette is loaded after the deck is switched on or when the deck is switched on after a cassette is loaded.

(1) When a cassette is loaded after the deck has been switched on.

When a cassette is loaded, S693 is switched ON. Then, current flows in C652 via route (1) and turns on Q659 until C652 is charged. With Q659 on, a part of the collector current (in the route (3)) turns on Q660 and supplies current to the reel motors (route (4)). The current in route (2) clamps the base of Q660 at about 2.5V and limits the emitter potential to about 1.8V.

The other part of the Q659 collector current (in route (5)) is sent to the brake solenoid drive circuit and used to drive the brake solenoid.

Since C522 is being charged in this time, the solenoid is operated intermittently as previously described.

When the solenoid is operated and the reel table brake is released, the reel table rotates to pull the slack in the tape because weak current flows in the right and left reel motors as previously described.

Since equal current flows in the right and left reel motors, the tape is balanced and slack eliminated. The torque at this time is very small, and can not damage the tape.

The time during which the current flows in the reel motors is a little longer than the time during which the brake is released due to different operating voltage between the reel motor circuit and the solenoid drive circuit. The signal in the route (9) is used to inhibit the SYS-CON output while a cassette tape is loaded. The signal in the route (10) is used to hold the tape end detection circuit while a cassette tape is loaded.

(2) When the deck is switched on after a cassette is loaded.

With a cassette loaded, S693 is turned on.

When the power switch of a deck is turned on in this condition, the DC power supply rises and current flows in route (1). Then current flows in routes (2) to (5), and (9) and (10) in the process described in (1).

C522 is still not charged by this time. Current does not flow in route (7), and it is impossible to operate circuits on and after Q524. To turn on Q524, bias current is supplied to Q524 via route (8) for a short time until C524 has charged. When Q524 turns on, Q525 turns on and then Q534 turns on and supplies +24V to the brake solenoid to operate it.

The other operations are the same as those on (1). Routes (11) and (12) are used to discharge C652 and C524, respectively.

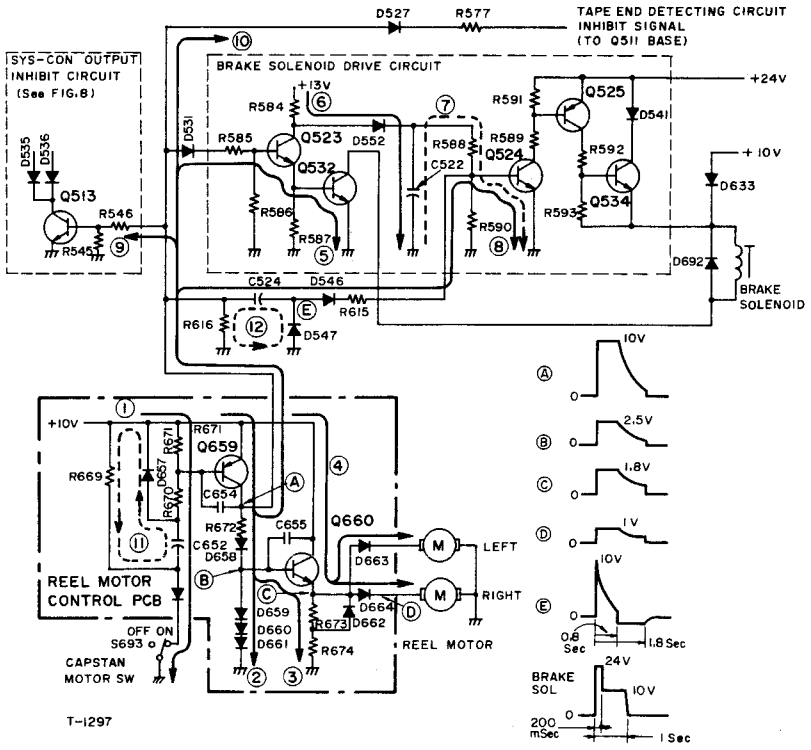


Fig. 11 Tape Loading Circuit

TAPE TRANSPORT SECTION

2-4 PLAY AND PAUSE

(1) Play

In the PLAY mode, a high level signal is output from pin 17 of the SYS-CON. The brake solenoid operates with the current in route (1), and releases the brake. Then Q523 turns on and the base current (in the route (2) of Q511 stops and thus Q511 turns off. While Q511 is being turned on, the tape end detection circuit is inhibited, but it is set in the standby condition when Q511 turns off. (Refer to the paragraph 2.7 for the tape end detection circuit). The current in the route (3) turns on Q522 and Q531, and actuates the head solenoid. When Q522 turns on, Q526 tuns off after about 150 milliseconds and operates the pinch solenoid drive circuit.

With Q526 turned off, Q527 and Q533 turn on. With Q533 turned on, the pinch solenoid operates and at the same time a low level signal is sent to the reel motor control PCB. This signal operates the reel motor control circuit so that the current necessary for play operation is supplied to the reel motors. (Refer to the Section 4)

With Q526 turned off, Q528 turns on and sends a low level signal to the OSC PCB of the amplifier section. This signal resets the muting of the playback amplifier.

(2) Pause

In the PAUSE mode, a high level signal is output from pin 18 of the SYS-CON. This signal operates as follows and sets the deck in the PAUSE mode.

Route (4): Turns on Q511 and inhibits the tape end detection circuit.

Route (5): Operates (or holds) the brake solenoid.

Route (6): Operates the head solenoid.

Route (7): Turns on Q526 and inhibits the pinch solenoid circuit. Stops the reel motor control signal at the same time. Further, turns off Q528 and sends a high level muting signal to the playback amplifier.

Route (8): Turns on Q502 and lights the PAUSE indicator.

In the PAUSE mode, the current in route (9) operates the reel motor control circuit which supplies weak current to the right and left reel motors to pull in the slack in the tape. (Refer to the Section 4, (3))

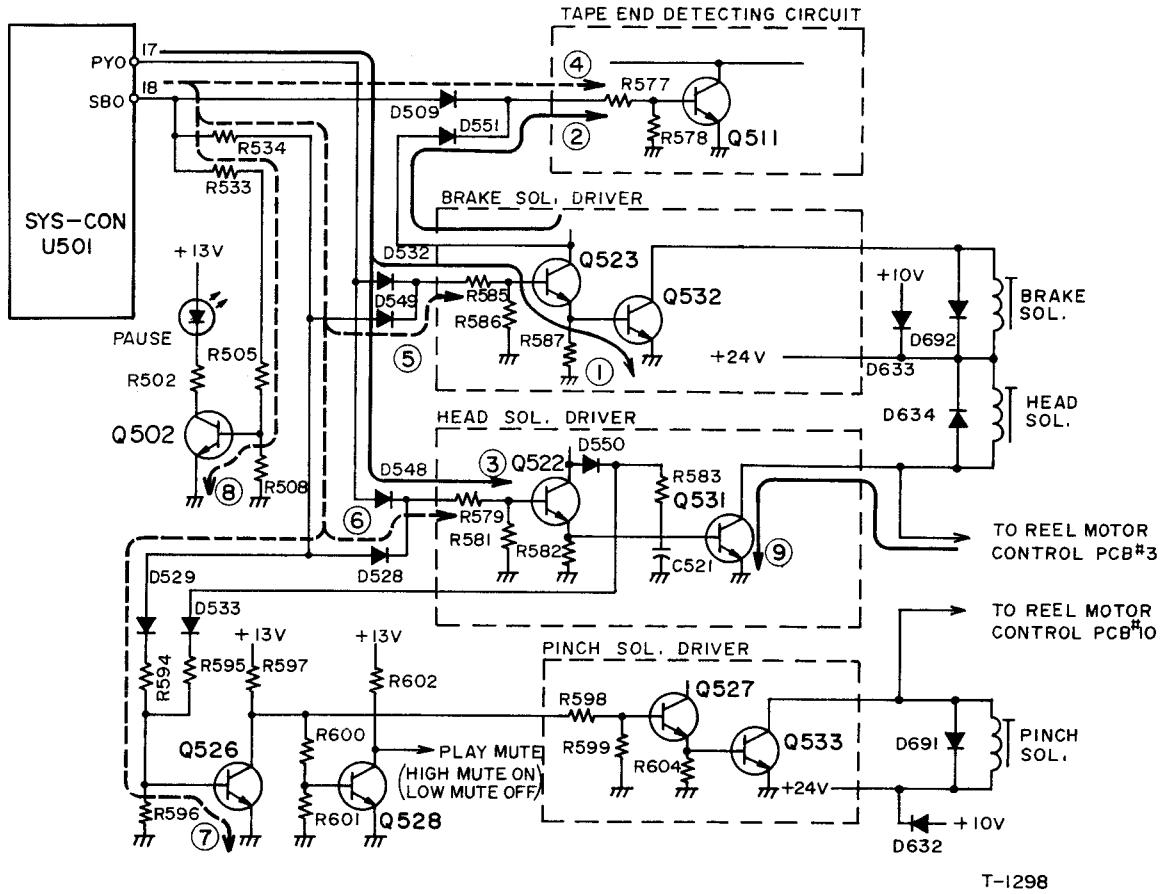


Fig. 12 Play and Pause Circuit

TAPE TRANSPORT SECTION

2-5 FAST FORWARD AND REWIND

Pin 20 of the SYS-CON goes high in the F. FWD mode while pin 20 goes high in the REW mode.

Both operation signals are sent to the reel motor control PCB and used to operate the reel motors. The signal is also used for the following operations.

Route (1): Operates the brake solenoid and releases the brake.

Route (2): Sets the end stops circuits which receives the output signal of the tape end detection circuit and resets the SYS-CON in the standby condition. Refer to pargraphs 2.7 and 2.8 for details of this circuit.

Route (3): Sets the automatic rewind stop circuit in the standby condition only in the REW mode. Refer to the paragraph 2.8 for details of this circuit.

Route (4): Turns on Q512 as well as charging C516. With Q512 turned on, this circuit inhibits outputs of pins 16 (REC), 17 (PLAY) and 18 (PAUSE). When the operation is switched from F. FWD or REW mode directly to PLAY, REC/PLAY, PAUSE or REC/PAUSE mode, this circuit is used to delay the switching until the tape has completly stopped. When the PLAY button is depressed during the fast forward operation, for example, pin 20 goes low immediately while pin 17 goes low. However, since Q512 is being turned on, the output signal of the pin 17 is bypassed in route (5) even if pin 17 goes high, and the head, brake and pinch solenoids are not actuated.

When pin 20 goes low, the signal in route (1) stops, the brake solenoid is turned off, and the reel table brake is applied and the tape is stopped. The charge in C516 starts discharging when pin 20 goes low. After C516 has discharged, Q512 turns off and the PLAY signal is no longer inhibited. The delay time due to C516 is about 200 milliseconds.

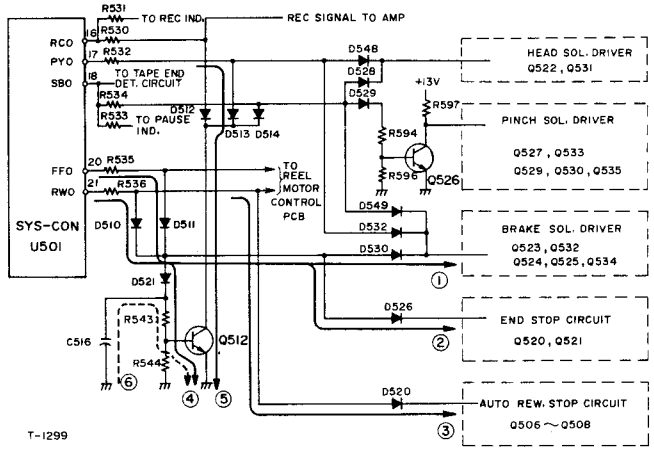


Fig. 13 Fast Forward and Rewind Circuit

2-6 RECORDING AND RECORD MUTING

Recording and record muting are impossible when pin 5 of the SYS-CON is high (when the erase protection tab of a cassette is broken off and S694 is set to the DISABLE position). When the RECORD button and the PLAY button are depressed together with S694 set to the ENABLE position, pins 16 and 17 go high and the REC PLAY mode is selected.

If the RECORD button and the PAUSE button are depressed together, pins 16 and 18 go high and the REC PAUSE mode is selected. The tape motion is controlled by the outputs of pins 17 and 18 as previously described. When the pin 16 goes high, a REC signal is sent to the amplifier section and at the same time Q503 turns on and lights the record indicator. The REC signal turns off the muting circuit of the recording amplifier and operates the bias oscillator. The output of the pin 16 turns on Q631 and operates the relay K631. The relay K631 inhibits the pitch control function during recording. (Refer to the Section 3) The record muting mode is selected only when the REC MUTE button is depressed during the REC PLAY operation. In this case, the record mode in not reset (pins 16 and 17 are still at the high level) and pin 15 goes high. The REC MUTE signal of pin 15 turns on Q501 and lights the REC MUTE indicator and mutes the recording amplifier only. Since the bias oscillator is being operated with the REC signal (output of pin 16), the tape runs without being recorded and a black space is recorded on the tape, The REC MUTE mode can be reset by the PLAY, PAUSE, F. FWD, REW and STOP buttons.

TAPE TRANSPORT SECTION

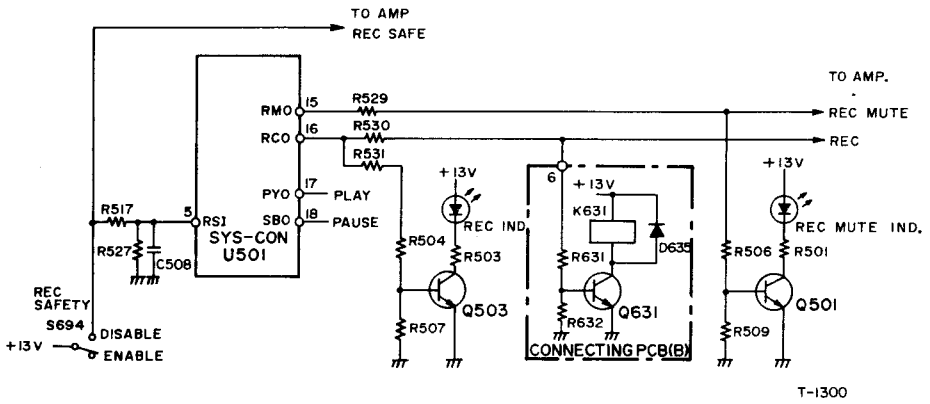


Fig. 14 Recording and Record Muting Circuit

2-7 TAPE END DETECTION CIRCUIT

The ring magnet shown in Fig. 16 is mounted on the shaft of the relay pulley transmitting the right reel table rotation to the index counter, and rotates as long as the tape is running. The hall effect element converts the change in magnetic field due to the ring magnet rotation into an electric signal. The output signal of the hall effect element is amplified by the differential amplifier comprising Q622 and Q623, and turns on and off Q621. (D621 is used to discharge C621.)

C515 is discharged faster by route (2) compared with route (1). Thus, while Q621 turns on and off repetedly, the potential at the point (D) does not rise and Q510 and Q509 are held off. When the tape stops running at the end, the ring magnet also stops rotation and the hall effect element outputs no signal. Thus, Q621 is held off and C515 is discharged in the route (1). When the potential at the point (D) reaches about +7V, Q510 turns on and then Q509 turns on and supplies a high level signal to the subsequent stage, About one (1) second delay time elapses after the tape stops until the detection signal is sent.

When the deck stops operation and the brake solenoid turns off or in the PAUSE mode or during the tape loading, a high level signal is applied to the base of Q511 to turn it on. While Q511 is on, the operation of the tape end detection circuit is inhibited.

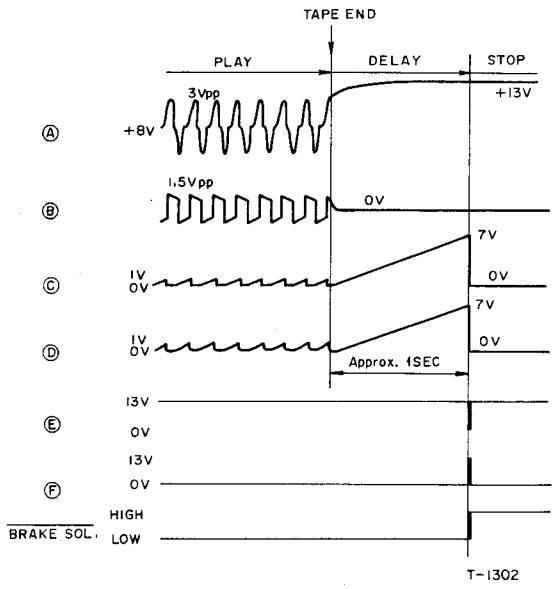


Fig. 15 Waveforms of Each Part of Tape End Detection Circuit (numeric value omitted)

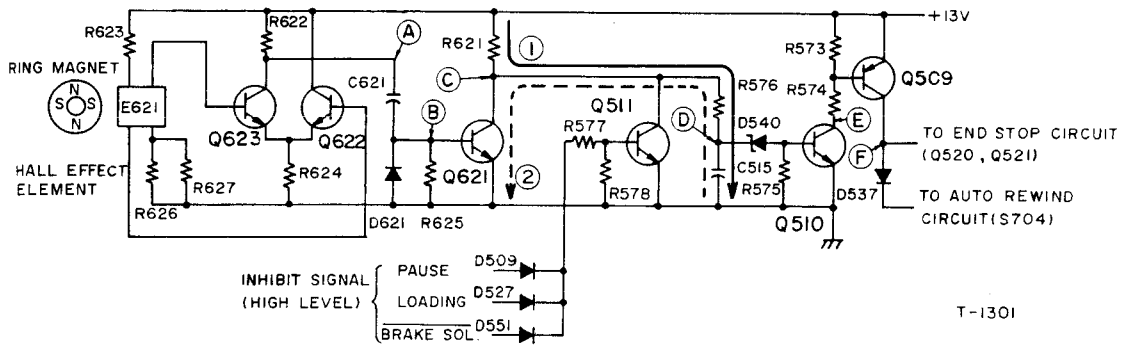


Fig. 16 Tape End Detecting Circuit

TAPE TRANSPORT SECTION

2-8 AUTOMATIC REWIND CIRCUIT

The automatic rewind operation is selected in three functions of (1) PLAY, (2) OFF and (3) STOP by the switch S704.

(1) PLAY

The tape cycle repeats play and rewind as follows.

PLAY → TAPE END → AUTO REWIND → Stop at count "999" → AUTO PLAY → .....

Assuming that the index counter is reset (to "000") and the deck is set in the PLAY mode. When the tape reaches the the end in the PLAY mode, the tape end detection circuit operates and Q509 outputs a high level signal. This high level signal is sent to pin 10 of the SYS-CON via route (1). The status in which a high level signal is present at pin 10 is equal to the condition when the REWIND button is depressed. Thus, the deck is set in the REWIND mode.

In the PLAY mode, pins 20 and 21 are at the low level, Q521base is also low and Q521 is off. Therefore, Q520 is held off even if Q509 turns on and Q520 base goes high.

Pin 21 goes high when the PLAY mode is changed to the REWIND mode. The output of pin 21 biases Q507 base via route (2) and Q521 base via route (3), and turns on each transistor.

The index counter counts down after the tape is rewound. The counter switch S695 closes when the counter reaches "999". The switch S695 is closed while the counter counts from "900" to "999".

Current flows in Q513 via route (4) and Q508 turns on. Q507 has base bias so when Q507 emitter falls to ground potential with Q508 turned on, Q507 turns on. At the same time Q506 is also turned on by the current in route (5).

With Q506 turned on, a high level signal is supplied to pin 8 via route (6) and the deck is set in the PLAY mode. When the operation mode is changed from REWIND to PLAY, about 200 milliseconds delay time elapses. (Refer to the paragraphs 2.5 and Fig. 13)

The current in the route (2) is interrupted when the operation mode is switched from REWIND to PLAY as described avobe. Thus, the charge in C512 is rapidly discharged by route (7).

If the REWIND button is depressed immediately after the PLAY mode is selected, current flows again in C512 (in route (2)). However, because of the charging time constant, the potential at the point (A) increases gradually. Therefore, even if S695 closes again and Q508 turns on, Q507 is not turned on and the PLAY mode is not automatically selected. In this case, the tape is rewound to the end regardless of the count of the index counter.

When the tape end is detected, Q509 turns on and a tape end signal is transmitted in routes (1) and (8).

In the REWIND mode, Q521 is turned on by the current in route (3) and thus Q520 is set in the standby condition. When Q520 base is biased by the current in route (8), Q520 turns on and Q516 is turned on by the current in route (9) and supplies a high level reset signal to pin 2 of the SYS-CON via route (10).

A rewind signal is also applied to the SYS-CON via route (1) at this time. However, since the reset signal has priority over all other input signals, all SYS-CON outputs are reset and the deck is set in the STOP mode.

(2) OFF

When the switch S704 is in the OFF position, the output of the tape end detection circuit is connected to the STOP button circuit. The STOP mode is selected in the PLAY, F. FWD and REWIND modes when the tape reaches the end.

(3) STOP

Tape cycle is as follows.

PLAY → TAPE END → AUTO REWIND → STOP (at count "999")

In the PLAY mode, the tape end signal sets the deck in the REWIND mode via route (11). When the count "999" is reached in the REWIND MODE, Q508, Q507 and Q506 turn on, a high level signal is applied to the SYS-CON via the route (12) and the deck is set in the STOP mode. When the tape end is detected before the count reaches "999" in the REWIND mode, the reset circuit operates and sets the deck in the STOP mode as previously described.

TAPE TRANSPORT SECTION

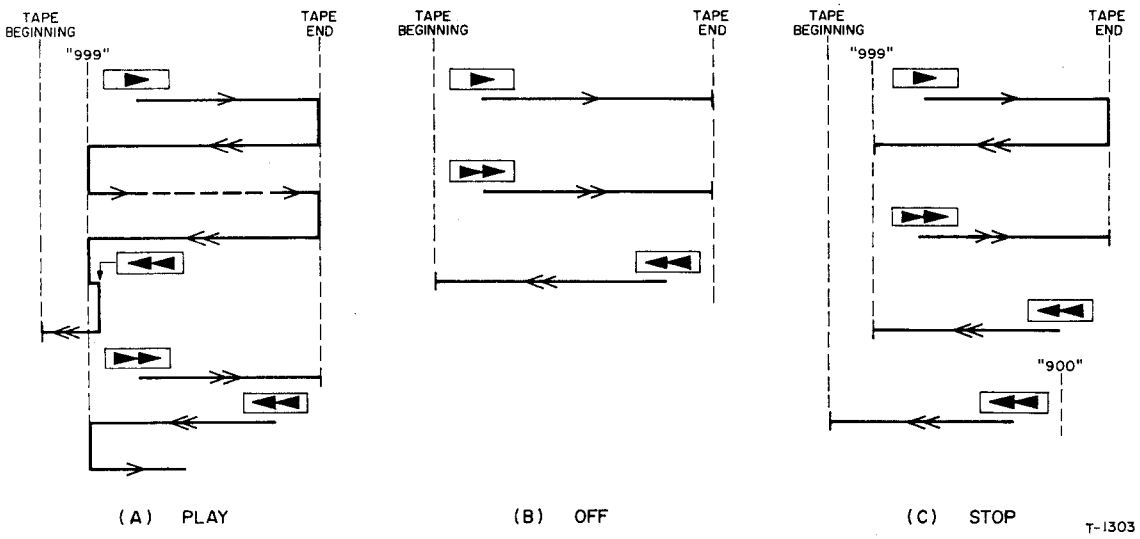


Fig. 17 Auto Rewind Switch Positions and Tape Cycle

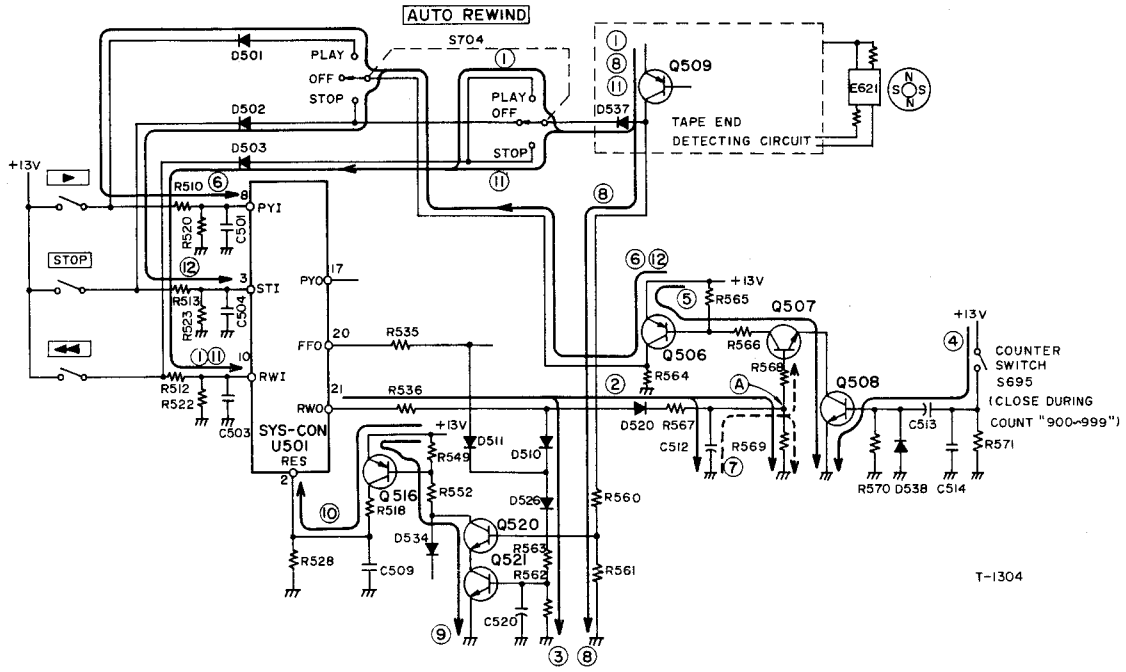


Fig. 18 Auto Rewind Circuit

TAPE TRANSPORT SECTION

2-9 TIMER CONTROL CIRCUIT

The timer control circuit turns AC power on and off supplied to C-1 by a timer switch external to the tape deck, and actuates the recording (playback) operation.

(1) Timer start circuit

Refer to Fig. 20. When the REC TIMER switch S692 is off, Q519 base is grounded and thus Q519 does not operate. When the deck is powered with S692 turned on, current flows in C517 via routes (1) and (2). Q519 is turned on by the current in route (1). Q519 collector current turns on Q518. Q518 supplies high level signals to pin 4 and 8 of the SYS-CON (via routes (3) and (4)). As described in the paragraphs 2.1, when the deck is powered, Q517 is turned on via route (5) and Q516 is turned on via route (6) and an initial power reset signal is supplied to the SYS-CON via route (7). The reset signals have priority over all other input signals. Thus, the SYS-CON does not operate as long as it is supplied with the rest signal.

When current flows in C517, the potential at point (B) is greater than that at point (C) because R556 is larger than R555. Therefore, when the potential at point (A) falls as C517 charging proceeds, Q519 is held on for a longer time. This relationship is illustrated in Fig. 19. As seen from Fig. 19, signals are left in routes (3) and (4) even after the SYS-CON reset signal has stopped. Thus, the deck is set in the REC-PLAY mode.

If the record protection tab is broken off, the PLAYBACK mode is selected instead of the RECORD mode.

When the power supply is interrupted, the charge in C517 is rapidly discharged via route (8) and C517 is set ready for the next start.

Intermittent recording (or playback) can be repeated any time until the tape reaches the end.

Current flows in route (1) only when the power switch is turned on. Thus, the deck mode is unchanged even if the REC TIMER switch is set to the "IN" position after the power switch is turned on.

(2) Timer stop circuit

The captsan motor rotates continously even after the tape stops at the end in ordinary recording or playback operation without using the timer.

There is usually nobody present during timer controlled recording, so it is undesirable that the captsan motor should rotate after the tape reaches the end. To avoid this, the circuit is designed so that the captsan motor also stops when the deck stops operation at the tape end during timer recording. (Refer to Fig. 21) Q904 to Q906 and their peripheral circuits comprise a constant voltage circuit which supplies power to the captsan motor.

Voltage values indicated in the circuit are those obtained in the course of recording or plyback. Values put in ( ) indicate values obtained when the timer is stopped. These voltage values are approximate.

While the deck is operating in the REC/PLAY mode, some voltage is applied to the anode of SCR D543 via routes (9) and (10). However, since Q509 of the tape end detection circuit is off at this time, SCR is cut off. When the tape end detection circuit operates at the tape end and Q509 turns on, current flows in the collector of Q509 via route (11).

Then, a very weak current flows from the gate to the cathode of SCR (via route (12)) and the SCR becomes conductive. With SCR turned on, current flows in routes (9) to (13) and (10) to (14). As current flows in routes (10) to (14), Q516 turns on and resets the SYS-CON. Then, the deck is set in the STOP mode. When current flows in routes (9) to (13), the potential at point (F) becomes about 2.2V. Thus, no current flows in the base of Q905 (and Q904) and the constant voltage circuit outputs no voltage. Power supply to the captsan motor circuit is stopped, and the captsan motor therefore stops. Even if the deck is set in the STOP mode and Q509 is turned off again, SCR is held conductive because a very weak current flows in the SCR via routes (9) to (13). To reset the timer stop condition, set the REC TIMER switch to the "OUT" position or turn off the deck power switch and turn off the SCR temporarily.

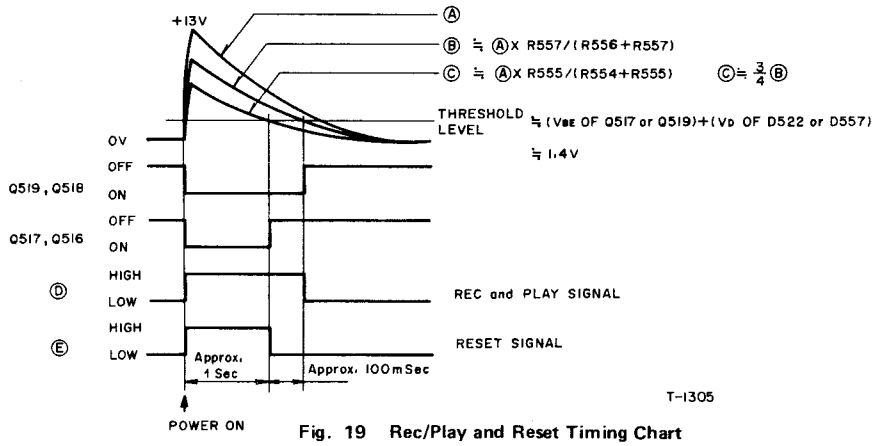


Fig. 19 Rec/Play and Reset Timing Chart

TAPE TRANSPORT SECTION

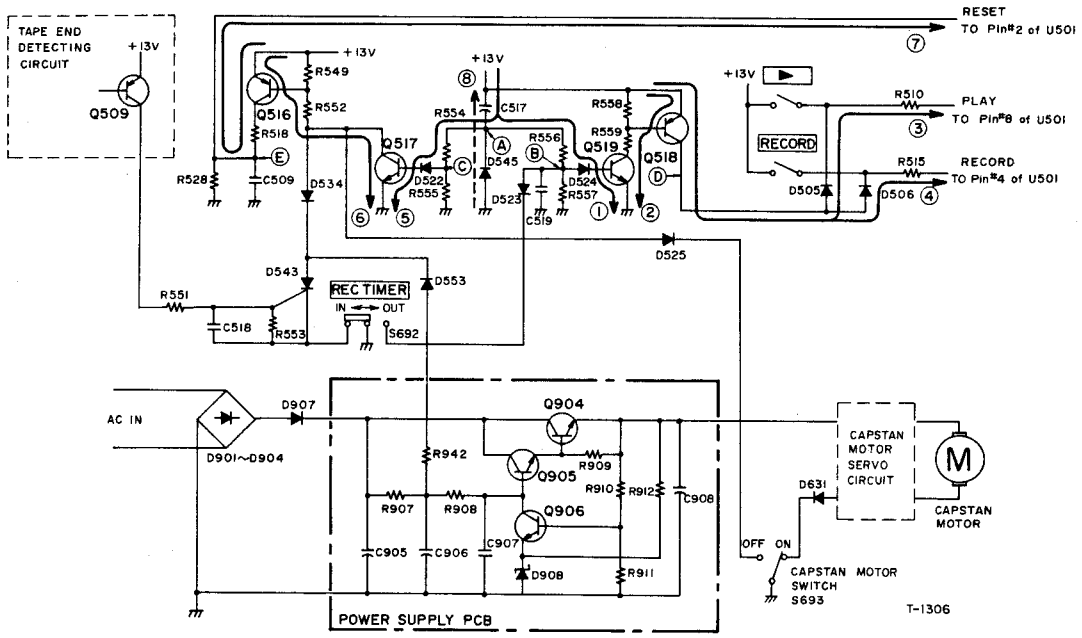


Fig. 20 Timer Start Circuit

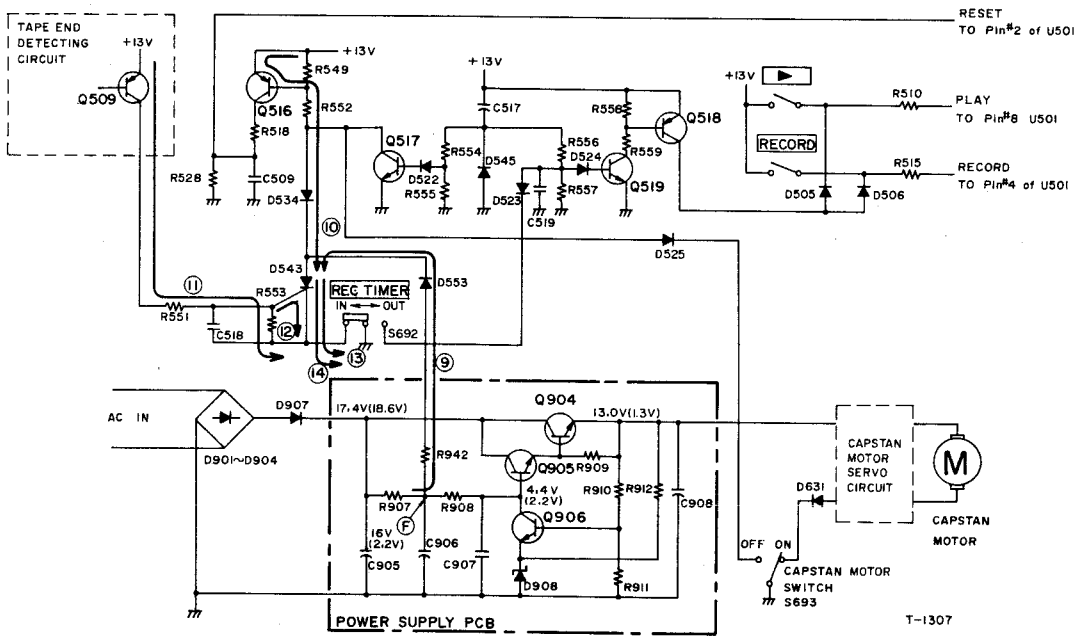


Fig. 21 Timer Stop Circuit

TAPE TRANSPORT SECTION

3. CAPSTAN MOTOR CIRCUIT

The captsan motor is a DC motor which has a frequency generator (FG) coil and is current controlled by a phase locked loop (PLL) circuit. When a cassette is loaded in the deck after the power switch is turned on, the switch S693 turns on and the servo circuit operates and starts rotation of the motor.

VR1 is used to set the motor speed (tape speed) when the PITCH CONT switch is off, that is, for ordinary recording or playback. Except in the REC mode, the tape speed when the PITCH CONT switch is on (for playback) can be varied ±6 % or more of the rated value by means of R691 (pitch control VR). VR2 adjusts the tape speed to the rated speed when R691 is set to the center position. The pinch control function does not operate during recording.

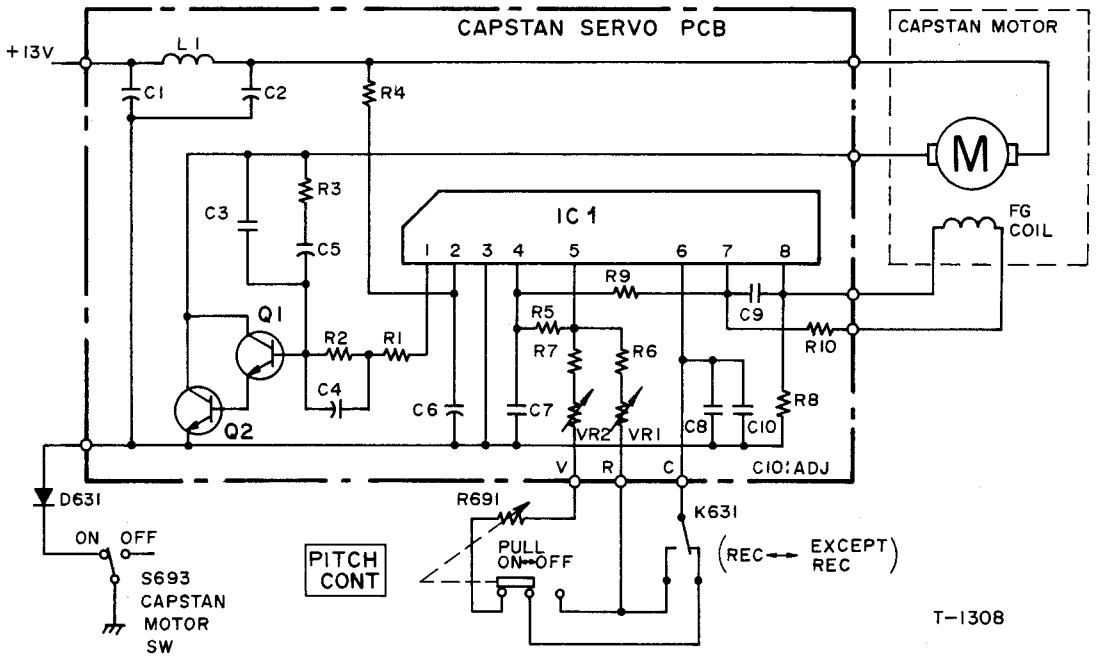


Fig. 22 Capstan Motor Circuit

TAPE TRANSPORT SECTION

4. REEL MOTOR CONTROL P.C.B.

The reel motor control circuit supplies reel motors with drive current required for PLAY, F. FWD and REWIND. The circuit also transmits a loading signal to pull the slack in the tape when a cassette is loaded in the deck, and drives reel motors to take up the tape. The circuit is divided for functions for convenience in this Section. Refer to the whole tape transport circuit for the function of the whole circuit.

4-1 TAPE LOADING

Refer to the paragraph 2.3.

4-2 PLAY MODE

When Q533 turns on (the pinch solenoid operates or PLAY or REC/PLAY mode is selected), the collector of Q533 goes low and Q651 and Q652 bias circuit operate. R651 adjusts Q651 collector current and gives back-tension torque to the left reel motor. The back-tension torque is about 8 gr. cm R652 adjusts Q652 collector current and gives take-up torque to the right reel motor. The take-up torque is about 44 gr.cm in the PLAY mode.

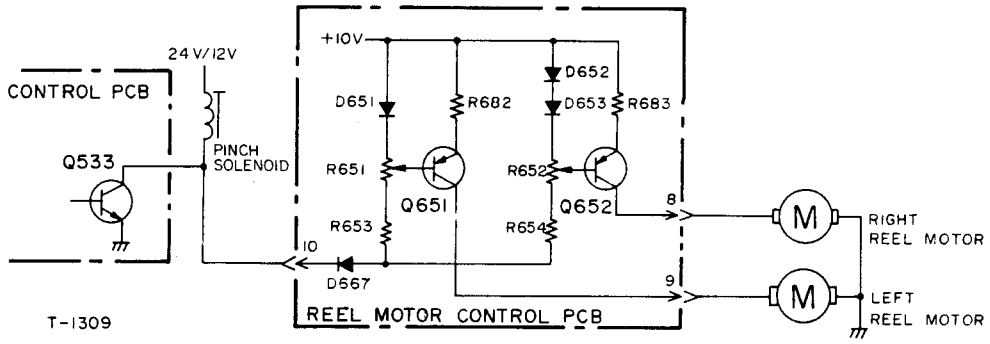


Fig. 23 Play Mode Circuit

4-3 PAUSE MODE

The reel brake is released in the PAUSE mode. This may cause slack in the tape owing to different timing or the right and left pinch rollers or to mechanical vibration. Thus, the circuit is designed so that a weak torque is given to the right and left reel motors to extend the tape in the PAUSE mode.

When Q531 turns on, the head solenoid is actuated. Q663 turns off in this time. When Q533 turns on, the pinch solenoid is actuated. Point (A) goes low at this time. Point (A) goes high only when Q663 is off (Q531 and the head solenoid are on) and Q533 (pinch solenoid) is off, that is, in the PAUSE mode. When point (A) goes high, Q662 turns on and then Q661 also turns on. Then, Q661 collector current flows in routes (1) and (2) and biases the base of Q660. The collector current of Q660 flows in routes (3) and (4) thereby torque is given to the motor. The motor torque is the same value as in the tape loading.

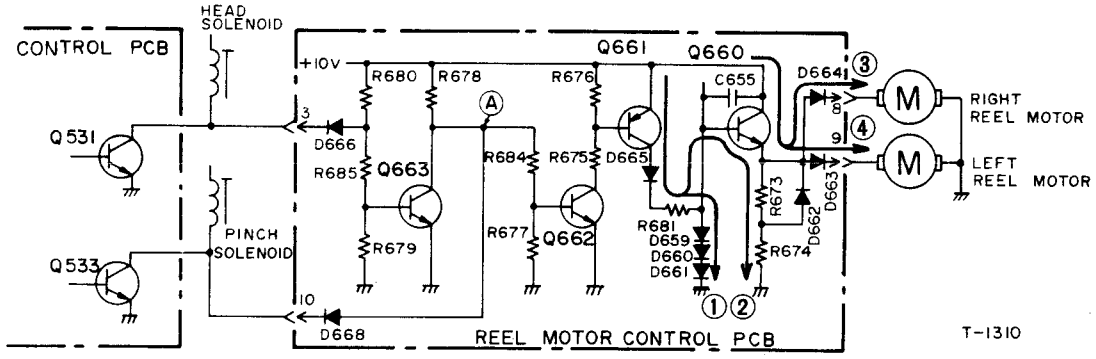


Fig. 24 Pause Mode Circuit

TAPE TRANSPORT SECTION

4-4 F. FWD AND REWIND MODES

A high level signal is supplied from the control PCB to terminal 7 in the F. FWD mode. Thus, Q655 turns on and then Q656 turns on and current flows in the right reel motor via route (1). In the REWIND mode, a high level signal is applied to terminal 6 and Q657 and Q658 are turned on and the left reel motor is driven. When the F. FWD button and the REW button are depressed at the same time, the SYS-CON outputs both F. FWD and REW signals. When Q657 is turned on with the REW signal, the collector current of Q657 drops the level of terminal 7 through D656. Thus Q655 cannot turn on. That is, the REW mode is preferential in this case.

In either F. FWD or REWIND mode, the take-up motor load is light at the begining of tape winding and gets heavier towards the end. Therefore, if the motor is driven by a constant current, the tape winding speed will slow down towards the end of the winding. To prevent this, a current supply circuit comprising Q653 and Q654 is provided. As the motor load becomes heavier and the motor speed slows down, the motor impedance (load resistance of the circuit) lowers and the potential at point (A) drops. The potential also drops at points (B), (C) and (D). Point (D) has the equivalent potential to the drop at point (C) after it has been divided by R658 and R659. Thus, the potential drop is larger at point (B) than at (D). As a result, Q654 is biased more strongly and the collector current is increased. Increase in Q654 collector current means an increase in C653 base current. Thus, the collector current of C653 increases and raises the load current. When the collector current of Q653 increases, the potential at point (C) and (A) increases. When the potential at point (A) increases, the potential at point (B) also increases and the bias given to Q654 tends to become smaller. However, since the potential at point (B) also increases together with that at point (C), the bias given to Q654 will balance when the collector current of Q653 increases to some extent. In the above process, the output voltage of the circuit increases gradually and raises the load current as the motor load becomes heavier.. The potential at the point (A) varies in the range of about 3.0V to 6.5V from the start to the end of tape winding.

In the F. FWD mode, for example, the drive current flows in the right reel motor via the route (1) and the motor rotates forward and takes up the tape. The left reel motor is pulled by the tape and is rotated inversely generating back electromotive force in the direction of the route (2). This back electromotive force is absorbed by the loop in route (3) and acts as an electromagnetic brake. The reverse rotation speed of the left reel motor increases towards the end of the tape and so the back electromotive force is increased and the loop current is raised. The larger the loop current, the stronger the electromagnetic brake force. The back electromotive force absorbing circuit and the motor current supply circuit described before suppress extreme change in the tape take-up speed in the fast forward mode. C653 inserted into the base circuit of Q657 is used to delay the start of the reel motors in the rewind mode for the following reasons:

In the PLAY mode, the head solenoid operates and pulls the erase head and the R/P head into the cassette so as to contact the tape. If the tape is driven at high speed with the heads in contact with the tape it is bad both for the tape and the heads.

Particularly in the AUTO REWIND mode, when the REWIND mode is selected immediately after the tape end is reached during the PLAY mode, the tape tension is very strong at the start of the rewind operation and thus the head solenoid turns off. In this case, the rewind operation must be delayed until the head is clear of the tape.

About 40 milliseconds delay elapses during which terminal 6 of the reel motor control PCB goes high, C653 is charged and Q657 is turned on, and then Q658 turns on and the motor is driven.

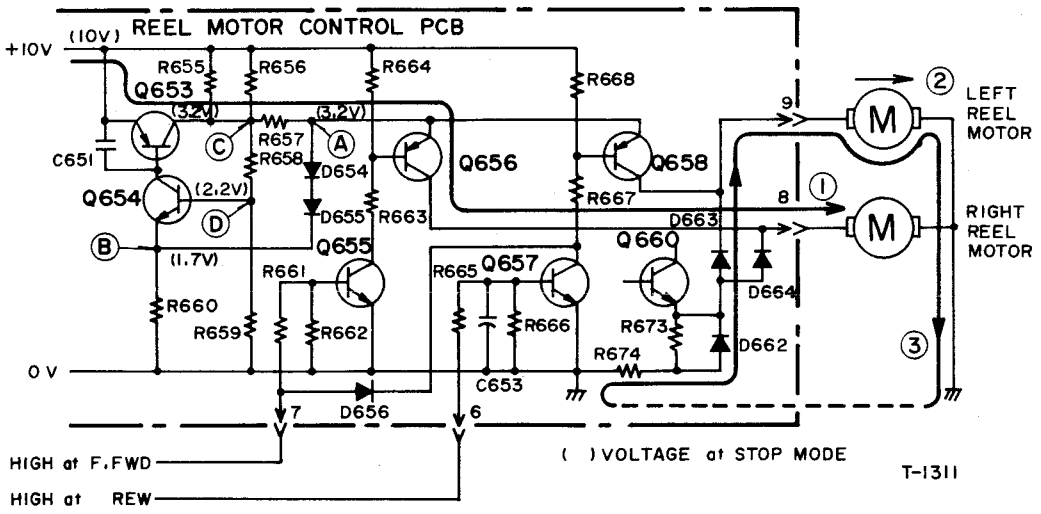


Fig. 25 F. Fwd. and Rewind Circuit

AMPLIFIER SECTION

1. INTRODUCTION

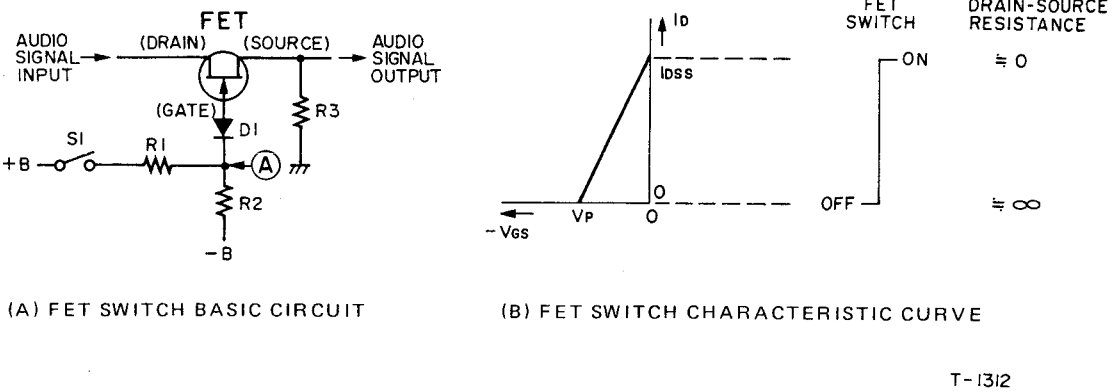
The C-1 is a three head tape deck and therefore has fully separate record and playback amplifiers. They have been designed for maximun dynamic range so as to be able to take advantage of the wide dynamic range made possible by the use of the add-on dbx unit.
Optional BIAS/EQ cards enable the user to attain optimum bias, EQ and sensitivity depending on the type of cassette tape he wishes to use.
The many other features of the C-1 include the use of Bicon cored heads for enhanced low frequency response, peak level meters and ganged record gain controls for added user convenience.

2. ELECTRONIC SWITCHING

To minimize stray signal wires (which contribute to cross-talk, RFI etc) extensive use is made of electronic switching. FET switches are used for switching audio signals and bipolar transistors are used in the equalizer, level adjusting and muting circuits.

2-1 FET SWITCHES

2SK68A-M N-channel junction type FETs are used for their excellent noise characteristics. Figure 1 shows the basic circuit configuration of the FET switches together with their switching characteristics. R3 sets the voltage present at the source of the FET to 0V. When S1 is open-15V (considerabley more than the pinch-off voltage which is about −0.5V) is present on the gate and the FET is cut off. In this condition the drain-source AC impedance is virtually infinite and thus the electronic switch is OFF.
When S1 is closed, D1 is reversed biased by the positive voltage present at the point A and no voltage appears at the gate of the FET (R1 is sometimes omitted), VGS falls at 0V and the drain-source impedance drops practically to zero. D1 acts as an isolating diode.



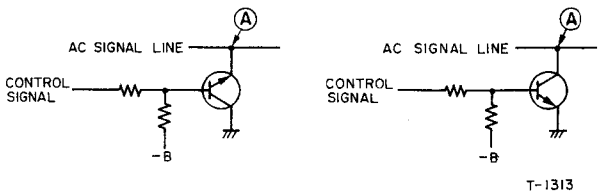
(A) FET SWITCH BASIC CIRCUIT (B) FET SWITCH CHARACTERISTIC CURVE

T-1312

Fig. 1 FET Switch

2-2 TRANSISTOR SWITCHES

NPN type transistors are used to control various AC signal networks. Figure 2 shows both grounded collector and grounded emitter configurations. When the transistors are on, the collector-emitter impedance is similar. However, the DC present at point A is about 0.4 mV in the case of grounded collector circuits and 4mV in the case of grounded emitter circuits. When the transistors turn off, the DC voltage drops to zero. Consequentely, grounded collector circuits are about 20 dB quieter than grounded emitter circuits as far as switch-off click is concerned. A negative voltage applied to the base of the transistors holds them off completely. In the case of Q108 and Q119, trasistors with large emitter-base breakdown voltages (VEBO) and reversed biased bases are required owing to the large voltage swings of the signals present.



T-1313

(A) GROUNDED COLLECTOR (B) GROUNDED EMITTER

Fig. 2 Transistor Switches

AMPLIFIER SECTION

3. SIGNAL SWITCHING CIRCUIT

The audio signal is routed by the SOURCE and NR SYSTEM switches and controlled by the FET switchs. Figure 3 shows the signal switching schematically.

3-1 NR SYSTEM CIRCUIT

(1) dbx (EXT) position

Q805 and Q811 go on and the dbx LED lights up if the C-1 is connected to a dbx unit (RX-8). LINE IN and MIC signals are selected by the INPUT switch and amplified by U301 after being level controlled by the RECORD gain control. The output from U301, called the LINE INPUT, is split and sent to the dbx encoder and to the monitor circuit (Q809). The encoded signal is received back from the dbx unit at the RCV terminals and is fed via Q811 and U302 to the record head. The signal from the playback head is sent to the dbx decoder after amplification. The decoded signal is returned to the RCV terminal, then via Q805 and on to the monitor circuit via Q807. If the NR SYSTEM switch is in the dbx (EXT) position but without a dbx unit being connected, recording and playback are not possible, though the LINE INPUT signal can still be monitored.

(2) OUT Position

Q803 and Q813 are turned on. The LINE INPUT signal is split, directly to the monitor circuit (Q809) and the other, bypassing the Dolby Encoder via Q813, is amplified by U302 and fed to the record head. The signal from the playback head is amplified and then fed to the monitor circuit, bypassing the Dolby Decoder via Q803.

(3) DOLBY Position

In the DOLBY position Q801 and Q815 are on and the Dolby LED lights up. The LINE INPUT signal is split, one path going to the monitor circuit (Q809) while the other is routed through the Dolby Encoder by Q815 and thence via U302 to the record head. The signal from the playback head is decoded by the Dolby Decoder and then goes to the monitor circuit.

3-2 MONITOR CIRCUIT

(1) SOURCE position

Q809 and Q817 are turned on. The LINE INPUT signal is split into two routes after passing through Q809. One signal passes through the OUTPUT volume control, and is sent to the OUTPUT terminal after being amplified.
The other signal is sent via Q817 to the PPM drive unit and drives the pick level meter needle.
The peak level meter indicates the recording input level adjusted by the RECORD volume control. The OUTPUT volume control adjusts the source monitor output level.

(2) TAPE CAL position

Q807 and Q817 are turned on. The playback signal is split, one path going to the OUTPUT terminal and the phone amplifier via the OUTPUT volume control amplifier while the other is routed to the meter circuit via Q817. Thus the peak level meter indicate the level recorded on the tape. the OUTPUT volume control changes the monitor output level without changing the meter indication.

(3) TAPE OUTPUT position

Q807 and Q819 are turned on. The tape is monitored as in the TAPE CAL position. However, since the meter circuit input is taken after the OUTPUT volume control in the TAPE OUTPUT position, the meter indicates the value controlled by the OUTPUT volume control.

AMPLIFIER SECTION

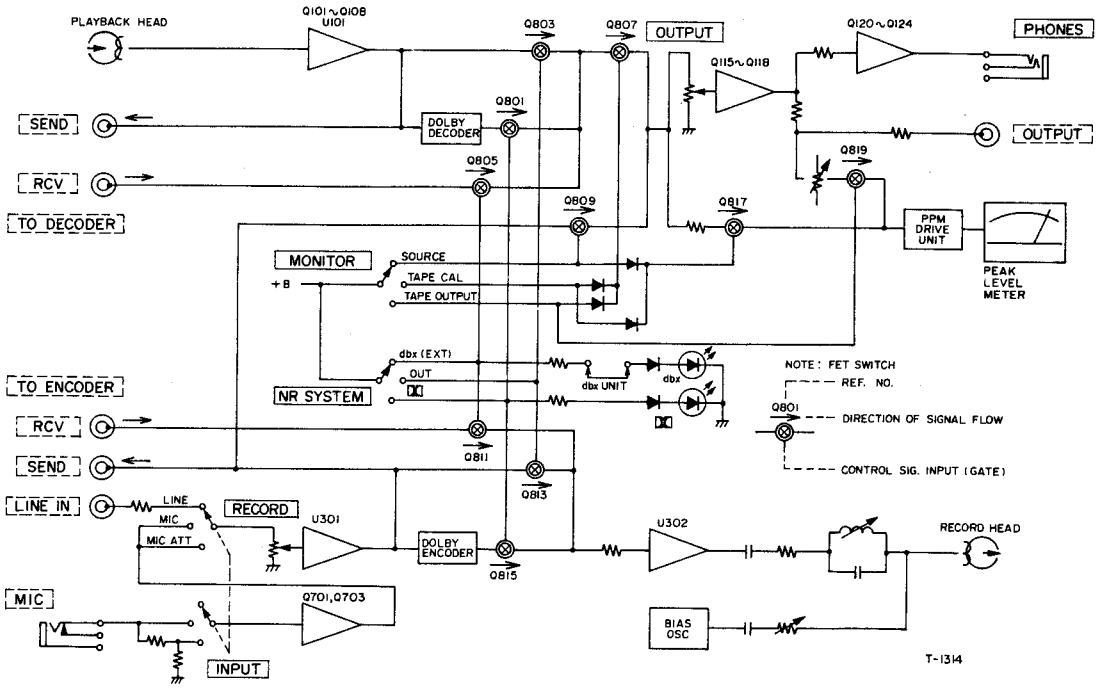


Fig. 3 Signal Switching Circuit

AMPLIFIER SECTION

4. PLAYBACK AMPLIFIER P.C.B.

4-1 PLAYBACK EQUALIZER AMPLIFIER

The playback equalizer amplifier comprises a differential input current mirror circuit (Q101 to Q103) and a pure complementary push-pull amplifier (Q105 to Q107).
Playback frequency compensation characteristics are determined by the negative feedback circuit (R111 to R113, C107) of the amplifier. The time constant T with the EQ switch set to the NORMAL position (Q104 off) is obtained by the following equation.

$T = C107 \times (R111 + R112 + R113) \fallingdotseq 120$ seconds

When the EQ switch is in the FeCr or CrO_2 position (Q104 on) the time constant T is as follows.

$T = C107 \times (R112 + R113) \fallingdotseq 70$ seconds

The differential input current mirror circuit is briefly explained below.
The circuit comprising Q3, Q4 and R1, R2 connected to the load of the transistor Q2 as shown in Fig. 4(A) acts as a current mirror circuit. As Q4 is connected with the diode with shortcircuited collector and base, it can be replaced by the diode D1 as shown in Fig. 4(B).

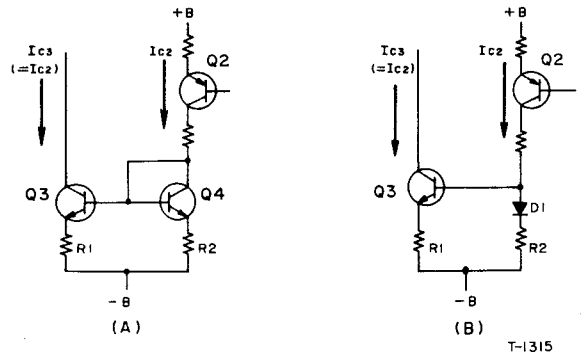


Fig. 4 Current Mirror Circuit

The current mirror circuit is established when the base-emitter characteristics of Q3 are the same as the diode characteristics and R1 equals R2. This circuit is characterized thus; when the collector current I_{C2} is applied to Q2, the collector current I_{C3}, which is the same value as I_{C2}, flows in Q3. I_{C3} reflects any change of I_{C2} just like a mirror. This is the reason why this circuit is called a current mirror circuit. Current mirror circuits are usually used in combination with differential amplifiers. (Fig. 5)
When no signal is received, the collector current I_{DC2} and I_{DC1} flow in Q2 and Q1. Thanks to the current mirror feature, I_{DC2} is made equal to I_{DC1}. If an opposite phase signal (shaded part in Fig. 5) is applied to bases of Q2 and Q1, the collector current I_{DC2} - di2 flows in Q2 (di2 indicates the change in current caused by the input signal) and

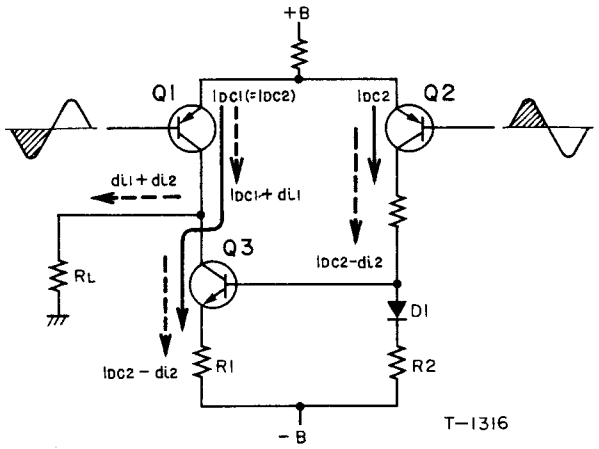


Fig. 5 Differential Input Current Mirror Circuit

the same current I_{DC2} - di2 flows also in Q3 by the current mirror feature. The current I_{DC1} + dil flows in the collector of Q1. If h_{FE} of Q1 equals that of Q2, dil equals di2. In an actual circuit, the input signal is applied to the base of Q1. The base of Q2 is connected with the NF circuit of the amplifier in the subsequente stage. The current I_L flowing in the load R_L is the difference between collector currents of Q1 and Q3, and is expresed as follows.

$$I_L = (I_{D1} + dil) - (I_{DC2} - di2)$$
$$= (I_{DC1} - I_{DC2}) + (dil + di2)$$

Where, $I_{DC1} = I_{DC2}$ and dil = di2. Thus, I_L is obtained by the following equation.

$$I_L = 2dil = 2di2$$

That is, a current which is two times larger than the change in I_{C1} or I_{C2} flows in the load. This means that the gain is increased by 6 dB by the current mirror circuit, compared with that obtained by a differential amplifier only.
The load is push-pull driven by Q1 and Q3, and distortion is minimized. I_{DC2} is well balanced with I_{DC1} in this circuit. These features make this circuit relatively unaffected by noise and temperature rise in the power supply.
In an actual circuit, the signal from the playback head is applied to the base of the transistor Q101 which corresponds to Q in Fig. 5. The base potential of Q101 is as low as about 0.11V, which is low enough to protect the playback head from DC leakage.
The latter stage of the playback head amplifier is composed of a pure complementary push-pull circuit, and is designed with particular care taken to suppress distortion and provide wide dynamic range.

AMPLIFIER SECTION

4-2 PLAYBACK LINE AMPLIFIER

The playback line amplifier consists of two OPE amplifier stages. A bias trap of 100 kHz and a playback muting circuit (Q108) are provided between stages.

The muting effect is released only while the tape is running after the pinch solenoid operates.

The playback line amplifier output has wide dynamic range and permits a +20 dB margin to facilitate connection to the Dolby NR unit or the dbx unit. The thermister S5C-34 is used to compensate for changes in the playback head sensitivity due to changes in temperature. The resistance value of the thermister is about 30k ohms at an ambient temperature of 25° C, it is raised as the temperature rises and vice versa. The playback head sensitivity increases as the temperature rises and vice versa. When the temperature rises and the playback head sensitivity increases, the playback head amplifier output level is raised. The thermister resistance falls at this time, and lowers the input to U101. As a result, the input to U101 is kept constant independent of temperature change.

4-3 DOLBY DECODER

Refer to Section 7.

5. RECORDING AMPLIFIER P.C.B.

Op. amps are used in all circuits except for the Dolby encoder. Every circuit is designed to offer low distortion and wide dynamic range. The first stage has a particularly large 100 dB dynamic range for sending signals to the dbx encoder. Bias trap circuits (L301, C304) and (L304, C363) of 100 kHz resonance fraquency are provided at input and output of the recording amplifier PCB.

L302, L303 and C312 to C314 comprise an MPX filter which removes the FM broadcasting pilot signal (19 kHz) and sub-carrier. A transistor switch is used to change over the equalizer and the recording level. Refer to the block diagram for the relation of the transistor switch to the EQ switch and the bias switch. The Dolby encoder is described in Section 7.

4-4 PLAYBACK OUTPUT AMPLIFIER

The playback output amplifier comprises Q115 to Q118. Q115 to Q117 compose the differential input current mirror circuit described before. Unlike the playback head amplifier an FET differential amplifier is incorporated in this circuit. The FET is used to increase the playback line amplifier input impedance to lighten the load on the circuit which supplies signals to this amplifier.

The use of FETs helps to suppress distortion and to increase the dynamic range. The muting transistor Q119 is provided at the line output terminal to effect muting to prevent unnecessary click noise upon turning on and off the power switch.

4-5 PHONE AMPLIFIER

The PHONE amplifier comprises a differential amplifier (Q120, Q121) and a pure complementary push-pull amplifier (Q122 to Q124). A large level margin is required on the supposition that the output dynamic range will be 80 dB or higher when the dbx system is used.

AMPLIFIER SECTION

6. OSC P.C.B.

6-1 BIAS OSC CONTROL CIRCUIT

Refer to Fig. 6.

Q833 is the OSC start-stop control transistor. Even if the OSC is under power, the oscillator circuit does not operate unless Q833 is on. R854, R855 and C807 of the base circuit of Q833 determine ON/OFF times of OSC. (Refer to Fig. 8)

The bias OSC circuit is powered from the constant voltage circuit Q830 to Q832. The OSC output level can be changed by varing the supply voltage.

When the REC safety switch is set to the DISABLE position, Q829 goes on, the constant voltage circuit does not operate and OSC does not operate.

When the BIAS switch is set to the CrO2 (OPTION) position, the bias can be adjusted from the front side of the deck by R7 on the BIAS/EQ card.

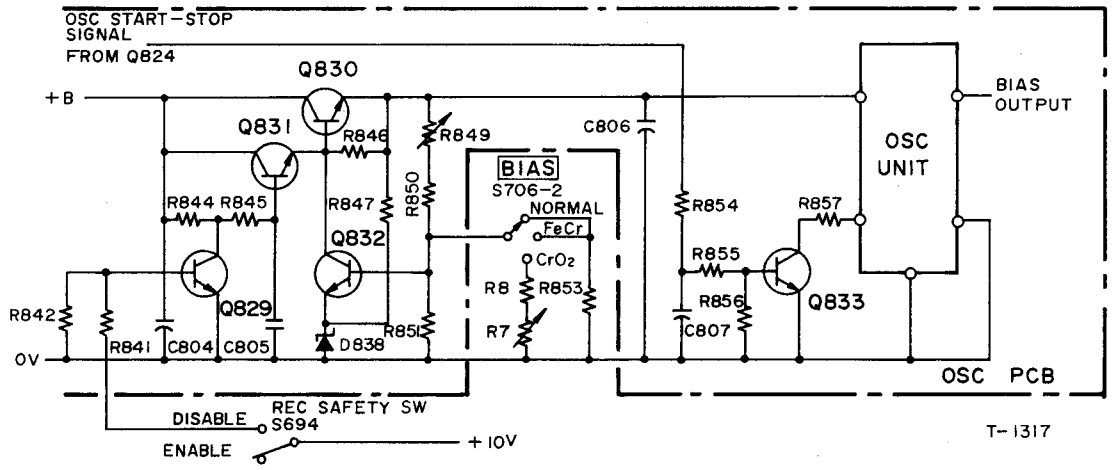


Fig. 6 Bias OSC Control Circuit

6-2 RECORD CONTROL CIRCUIT

The record control circuit receives a REC signal and a REC MUTE signal from the control PCB, and controls start-stop of the BIAS OSC as well as turning on and off the muting circuit of the recording amplifier. Refer to Fig. 7 and Fig. 8.

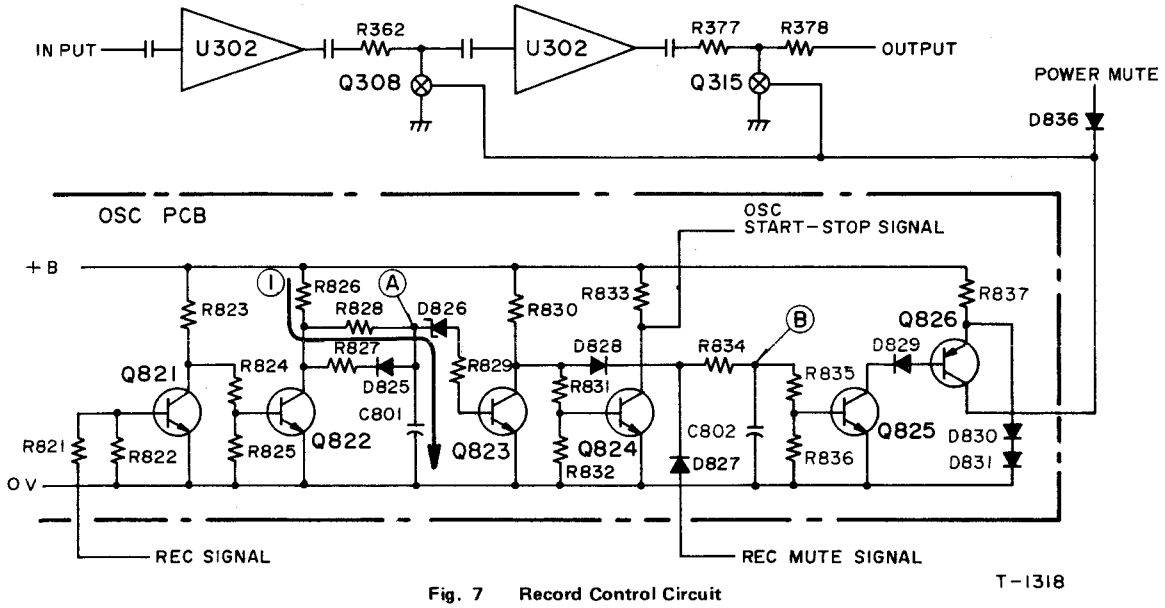


Fig. 7 Record Control Circuit

AMPLIFIER SECTION

When both REC and REC MUTE signals are low, the conditions of the transistors are as follows:

ON Q822, Q824, Q825, Q826

OFF Q821, Q823

With Q824 turned on, the bias start signal is low and oscillation is stopped. When Q826 is turned on, the collector of Q826 generates about +1.5V and turns on Q308 and Q315 thereby activating the muting circuit of the recording amplifier.

When the REC signal goes high, Q821 turns on while Q822 turns off. With Q822 turned off, the charging current flows in C801 via route (1). When about 7V is present at point (A), Q823 turns on. Then, Q824 turns off, and the collector goes high to start oscillation.

A delay of about 200 milliseconds elapses until an oscillation start signal is delivered after a REC signal is received. (A further 150 milliseconds are required to actually start oscillation after the oscillation start signal is received by the oscillator). When Q823 turns on, the charging current flowing in C803 is stopped, and the charge in C803 is discharged via R838 and Q825. When the discharging operation is completed, Q825 and Q826 turn off and then Q308 and Q315 turn off, and the muting circuit of the recording amplifier turns off.

About 100 milliseconds are required to release the muting effect after Q823 turns on. These delay times are required to prevent click noise from being recorded before starting the program source recording.

When the REC MUTE signal goes high during the REC mode, Q825 and Q826 turn on and thus Q308 and Q315 turn on. Then, the muting circuit of the recording amplifier turns on. Since the bias oscillation is performed with Q824 turned off at this time, no signal is recorded on the tape.

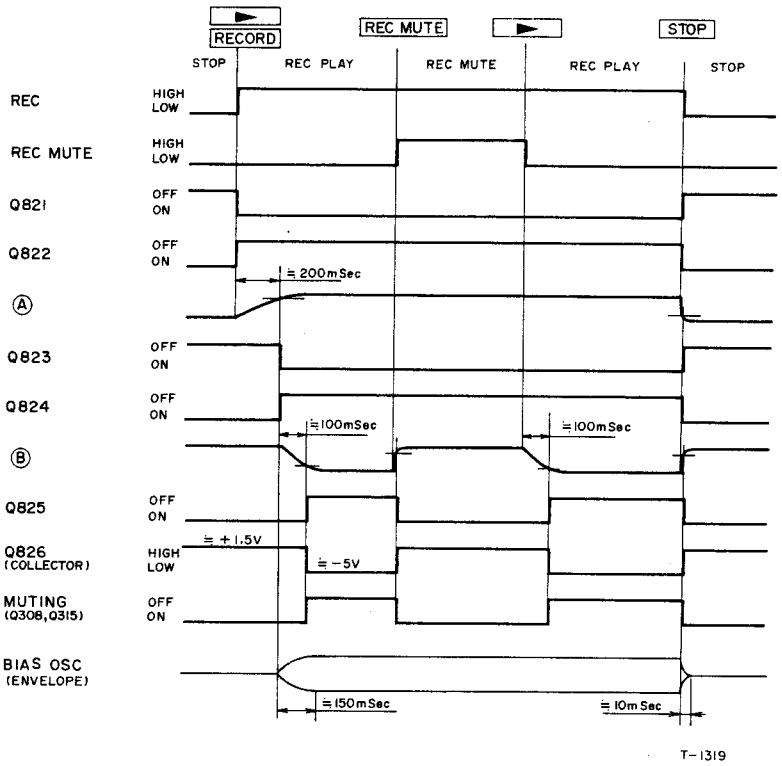


Fig. 8 Record Control Timing Chart

6-3 PMM DRIVE UNIT

This unit drives the peak level meter. The peak level meter is preset to 10m sec for the attack time and 750m sec for the recovery time.

AMPLIFIER SECTION

7. DOLBY ENCODER/DECODER

7-1 ENCODER

The input signal is split, one path going to AMP-1 via R315 while the other is routed to AMP-1 through a HPF (high pass filter), AMP2, R316.

E2 varies in the value depending on the input signal frequency and level, and is usually at the same phase as E1. Therefore, the input to AMP-1 is the signal obtained by adding E1 to E2. The signal passing through RPF is amplified by AMPs −2 and −3. The amplified signal is then rectified by D305 and D306. The DC voltage output of D305 and D306 is sent to the gate of Q303. Q303 is an electronic attenuator. The AC impedance between drain and source lowers and signal attenuation increases as the gate potential rises. The operating point is determined by the source potential, and adjusted by R333. When the original signal frequency is high (5kHz or higher) and the signal level is low (−30 dB or lower), signal attenuation in Q303 becomes minimum. (The output is boosted by about 10 dB)

D303 and D304 comprise a limiter. When an input signal of sufficient level is given, a control signal passes through HPF, AMP-2 and AMP-3, and the rectified and smoothed signal is applied to the FET. In the very short time before FET operates, the input signal is amplifed by AMP-2 to become E2. The signal is output at a high signal level. This phenomenon causes distortion in tape recording or causes an unnatural sound by shifting the operation point in the subsequent amplifier stage. To prevent this, the limiter circuit is used to clip high level input signals.

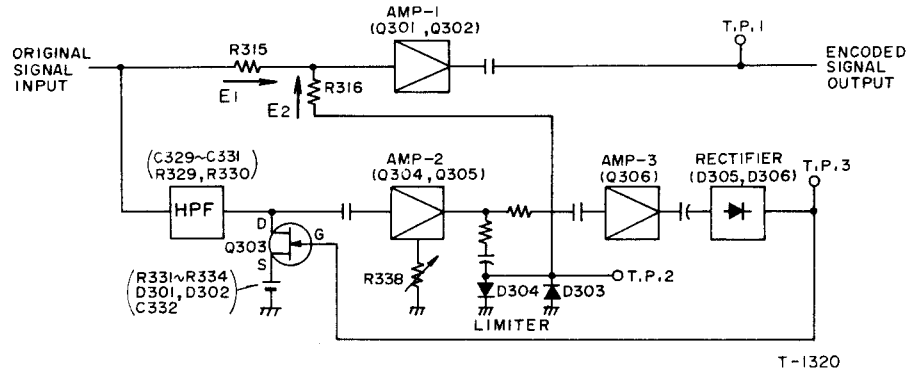


Fig. 9 Dolby Encoder

7-2 DECODER

The signal which becomes E2 is taken from the output of AMP-1 (In contrast to the encoder). Input and output phases of AMP-1 are opposite. As AMP-1 has a gain of 1, E1 and E2 are opposite in phase. That is, the input to AMP-1 is the value obtained by subtracting E2 from E1. Thus, decoder characteristics are opposite those of the encoder.

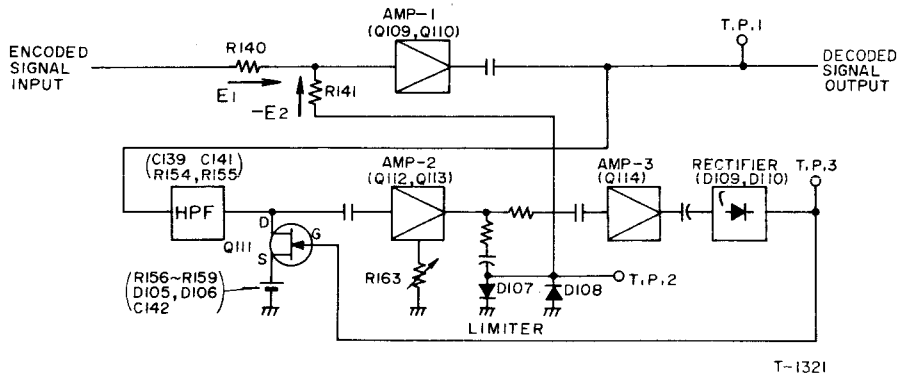


Fig. 10 Dolby Decoder

AMPLIFIER SECTION

8. POWER MUTING CIRCUIT

When the power switch is turned on and off, muting is effected in the playback output circuit, the meter circuit and the recording amplifier in order to prevent click noises and unnecessary meter deflection. The muting signal is provided by a circuit on the power supply PCB (Fig. 11).

When the deck is powered up a charging current flows in C929 through routes (1) and (2). Q916 turns on for about 2 seconds, during which C929 charging is completed. The muting signal (high) is transmitted via route (3) during this charging time.

When the power switch of the deck is turned off, the charge in C929 is rapidly discharged via route (4), and the point (A) falls to a low level. Thus, Q916 base current flows in the route (5) and Q916 turns on, producing the muting signal. The muting signal continues until the charge in C928 and C927 has completely discharged.

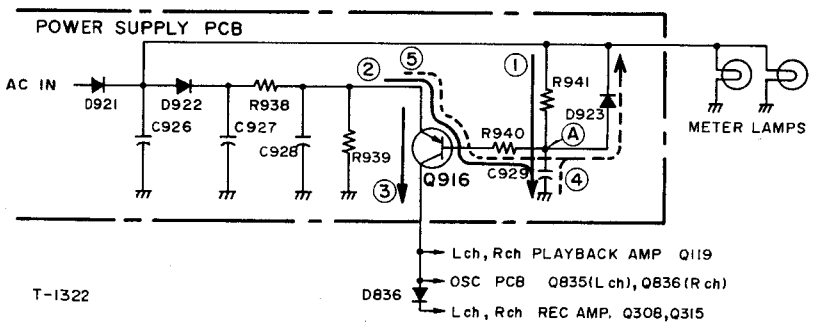


Fig. 11 Power Mute Circuit

MEMO

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PRINTED IN JAPAN 0179 SK 2.0 D-3061A

TEAC®

PARTS LIST

C-1

Stereo Cassette Deck with Dolby System

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PARTS ORDERING INFORMATION

Spare parts are available through your nearest TEAC Authorized Service Center or directly from the TEAC office, the address of which is written on the back cover. When ordering parts always include the following information:

1. MODEL
2. REF. NO.
3. PARTS NO.
4. DESCRIPTION
5. UNIT SERIAL NO.
6. MANUAL CODE NO.

NOTICE REGARDING PARTS ORDERS

1. Do not order by REF. NO. only.
2. In some instances, individual minor parts are not available. In such a case, the entire assembly including the part requested will be sent to you.
3. Parts are identical between the different models with the exceptions as coded by the designations in the REMARKS column.
4. PC Boards shown viewed from foil side.
5. Part marked with * require longer delivery time than regular parts.

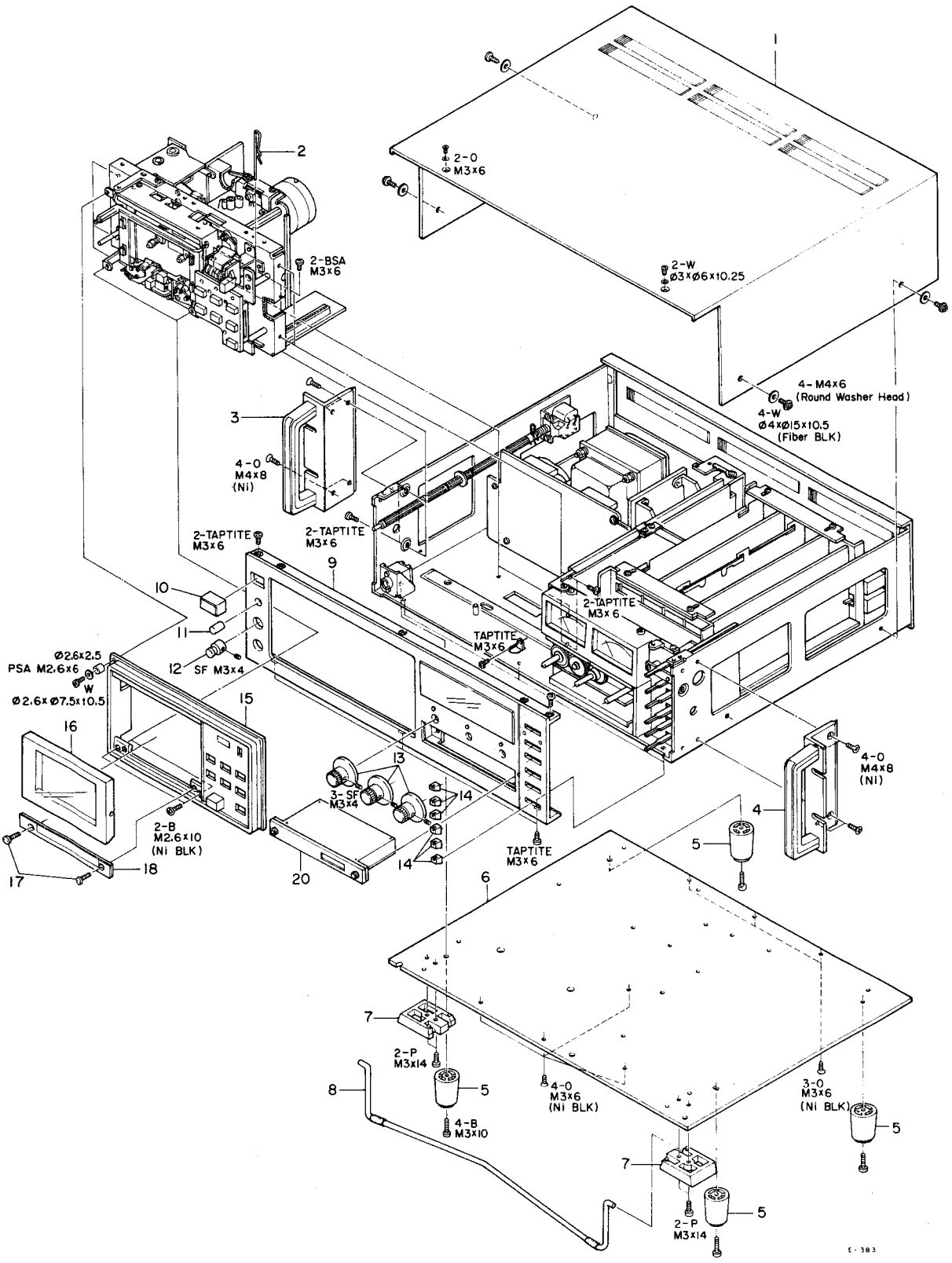
TEAC CORPORATION

Effective: July 1978 CI-031

51032320

1. EXPLODED VIEWS AND PARTS LISTS

EXPLODED VIEW-1

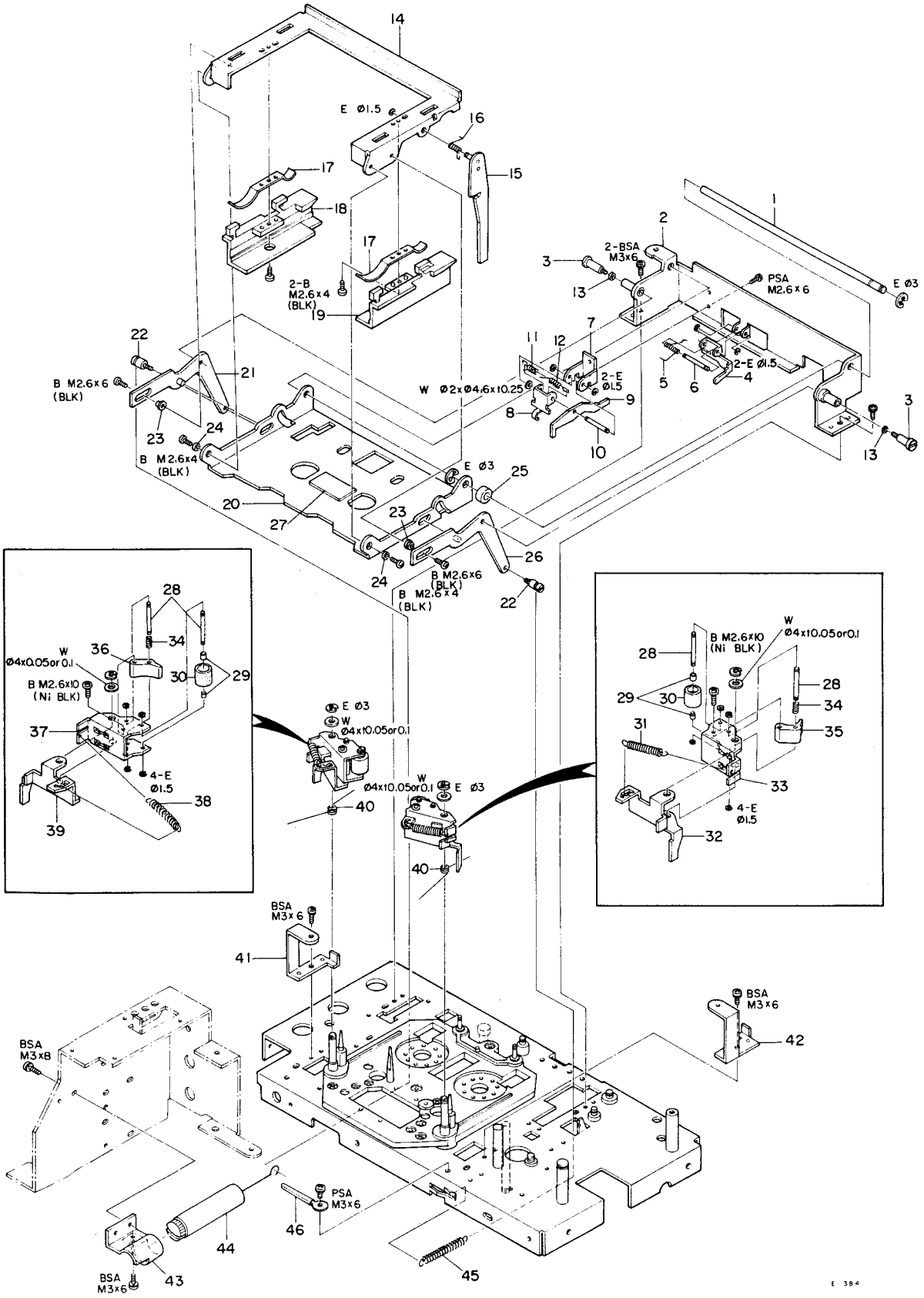


REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
1 - 1	*55522820	Cover, Top; A	
1 - 2	55241630	Retainer, Escutcheon	
1 - 3	*55031490	Handle Assy, A-L (CREAM)	JAPAN
	*55031510	Handle Assy, B-L (BROWN)	All except JAPAN
	*55031540	Handle Assy, C-L (GOLD)	U.S.A., CANADA
1 - 4	*55031500	Handle Assy, A-R (CREAM)	JAPAN
	*55031520	Handle Assy, B-R (BROWN)	All except JAPAN
	*55031550	Handle Assy, C-R (GOLD)	U.S.A., CANADA
1 - 5	*55045520	Foot	
1 - 6	*55031530	Cover Assy, Bottom	
1 - 7	*55331530	Leg, Rubber	
1 - 8	*55031440	Stand Assy	
1 - 9	55021870	Panel Assy, Front; A (CREAM)	JAPAN
	55021880	Panel Assy, Front; B (BROWN)	All except JAPAN
	55021890	Panel Assy, Front; C (GOLD)	U.S.A., CANADA
1 - 10	55344310	Button, B	
1 - 11	55342960	Button, Push	
1 - 12	55447800	Knob, PITCH CONT	
1 - 13	55430270	Knob, VR	
1 - 14	55345210	Knob, Lever Switch	
1 - 15	55021901	Escutcheon Assy, A	
1 - 16	55031480	Cover Assy, Cassette	
1 - 17	55447290	Screw, Trim	
1 - 18	55345120	Cover, Head; B	JAPAN
	55345110	Cover, Head; A	All except JAPAN
1 - 19		(Not used)	
1 - 20		CX-8, C-CO (CREAM)	JAPAN
		CX-8, B-CO (BROWN)	All except JAPAN
		CX-8, G-CO (GOLD)	U.S.A., CANADA

INCLUDED ACCESSORIES

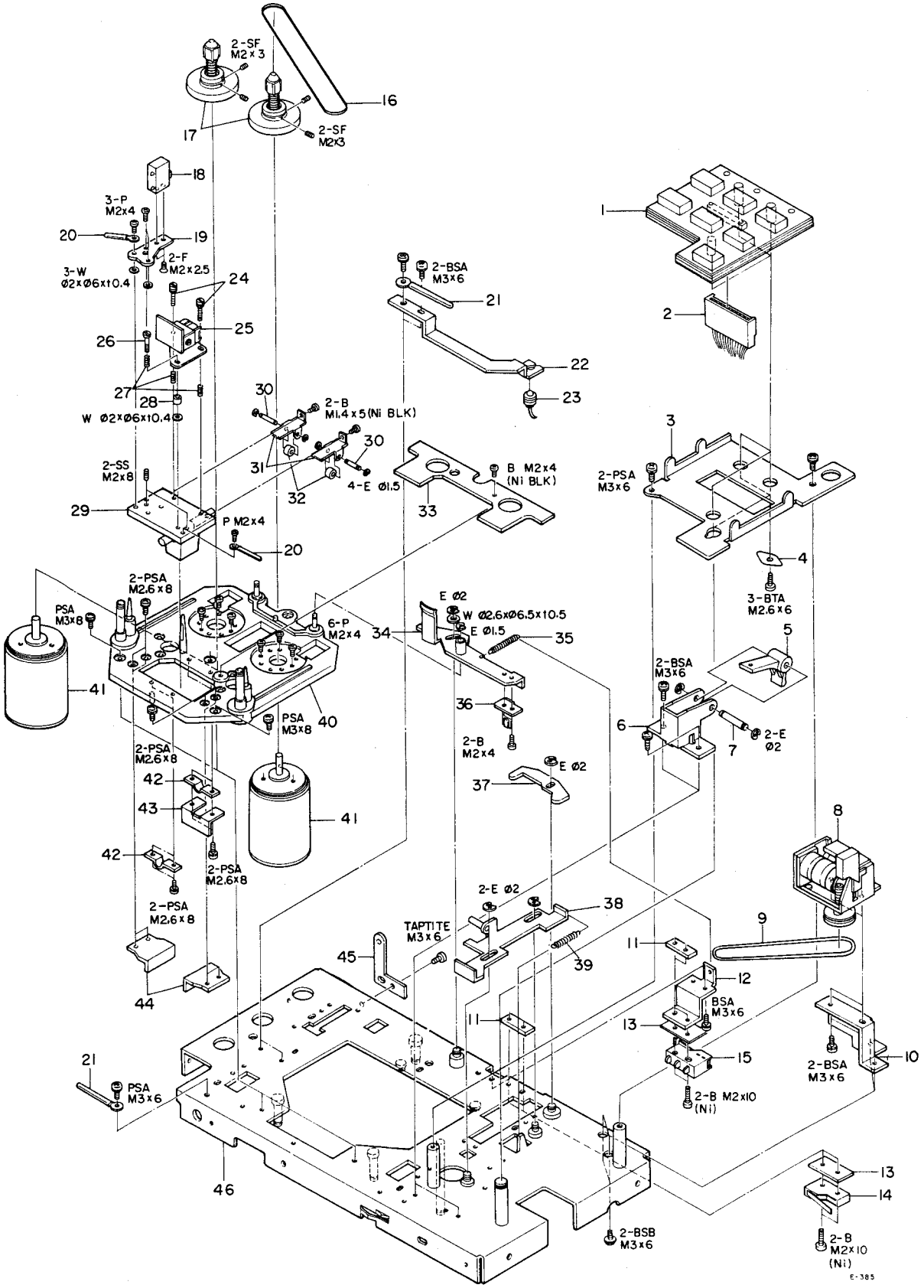
REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
	*51280650	Cord, Input-output Connection	
	*51013690	Information Supplement, Cassette	JAPAN
	*51013450	Information Supplement, Cassette	U.S.A., CANADA
	*51014130	Information Supplement, Cassette	All except JAPAN, U.S.A., CANADA
	*50265690	Label, Dolby	
		CX-8, C-Cr (CREAM)	JAPAN
		CX-8, B-Cr (BROWN)	All except JAPAN
		CX-8, G-Cr (GOLD)	U.S.A., CANADA
		Screw, F M3 x 6 (BLK Ni) 4 used	
		Screw, O M5 x 15 (BLK Ni) 4 used	
		Screw, O M5 x 15 (Ni) 4 used	
		Washer, ϕ5 (BLK Ni) 4 used	
		Washer, ϕ5 (Ni) 4 used	
	*51015540	C-1 Owner's Manual	JAPAN
	*51015550	C-1 Owner's Manual	U.S.A., CANADA
	*51015560	C-1 Owner's Manual	All except JAPAN, U.S.A., CANADA

EXPLODED VIEW-2



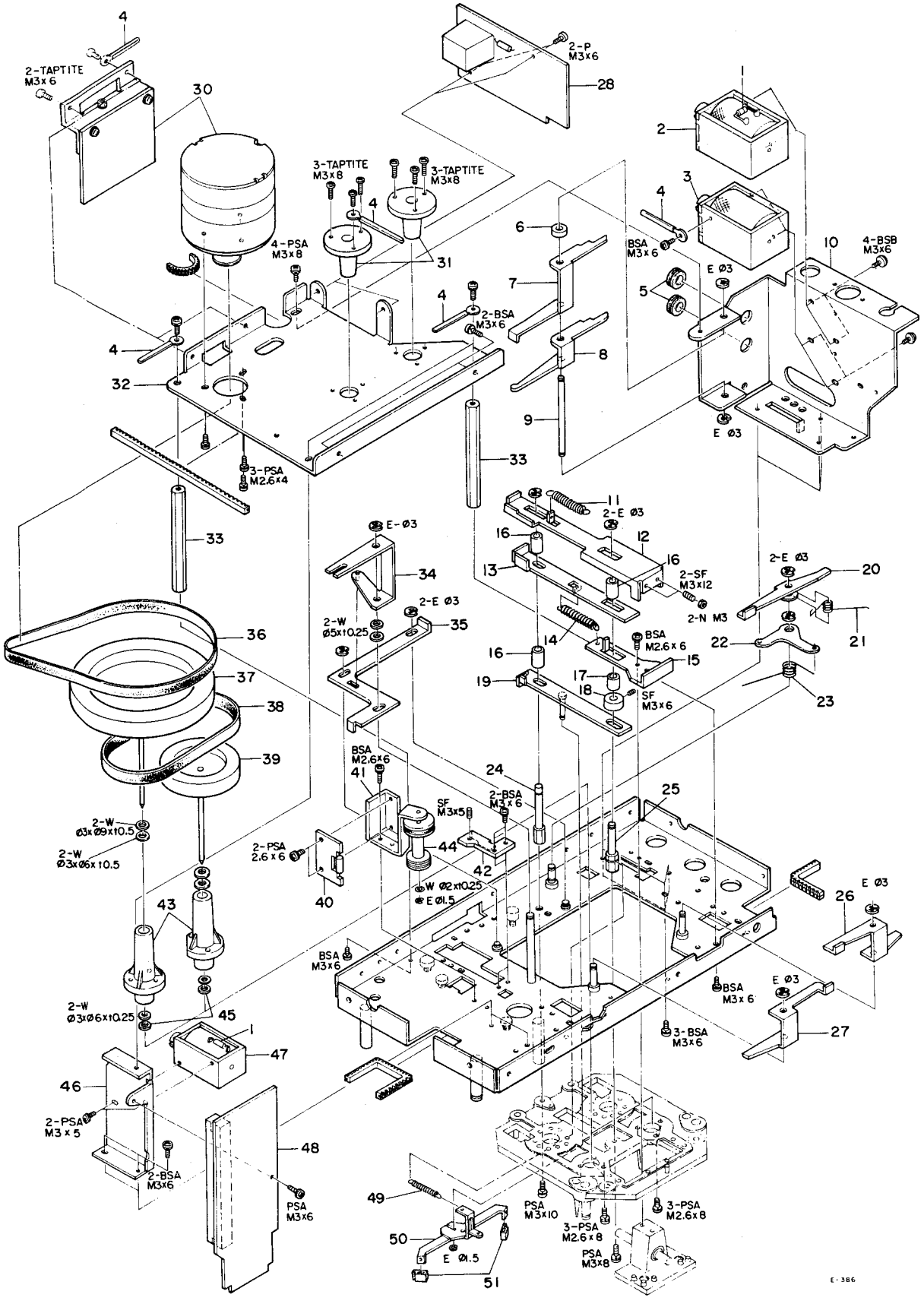
REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
2 - 1	*55447530	Shaft, Cassette Holder	
2 - 2	*55046300	Bracket Assy, Cassette Holder	
2 - 3	*55447740	Pin, Guide	
2 - 4	*55552970	Arm, Cassette Pressure	
2 - 5	*55241370	Spring, Cassette Pressure	
2 - 6	*55448880	Shaft	
2 - 7	*55554700	Holder, Preventing Arm	
2 - 8	*55553210	Arm, Record Preventing	
2 - 9	*55554710	Lever, Record Preventing	
2 - 10	*55448880	Shaft	
2 - 11	*55241350	Spring, Record Preventing; A	
2 - 12	*55241360	Spring, Record Preventing; B	
2 - 13	*55448950	Collar, Guide	
2 - 14	*55046270	Holder Assy, Cassette; U	
2 - 15	*55046290	Cam Assy, Lock	
2 - 16	*55241590	Spring, Lock Cam	
2 - 17	55553050	Spring, Cassette Pressure	
2 - 18	55331320	Guide, Cassette; R	
2 - 19	55331330	Guide, Cassette; L	
2 - 20	*55532260	Holder, Cassette; L	
2 - 21	*55045530	Link Assy, L	
2 - 22	*55447750	Hook, Spring	
2 - 23	*55447510	Collar, C	
2 - 24	*55447760	Collar, Link	
2 - 25	*55447520	Collar, Cassette Holder	
2 - 26	*55045610	Link Assy, R	
2 - 27	*55342460	Cover, Lamp	
2 - 28	*55448540	Shaft, Pinch Roller	
2 - 29	55447590	Collar, Pinch Roller	
2 - 30	55046400	Pinch Roller Assy	
2 - 31	55203600	Spring, Pinch Roller	
2 - 32	*55553060	Sub-Arm, Pinch Roller; T	
2 - 33	*55532290	Arm, Pinch Roller; T	
2 - 34	55203590	Spring, Guide	
2 - 35	55345660	Guide, Pinch Roller; T	
2 - 36	55345670	Guide, Pinch Roller; S	
2 - 37	*55532300	Arm, Pinch Roller; S	
2 - 38	55241400	Spring, Pinch Roller; B	
2 - 39	*55553070	Sub-Arm, Pinch Roller; S	
2 - 40	55203610	Spring, Pinch Roller Return	
2 - 41	*55552940	Angle, Stop; S	
2 - 42	*55552930	Angle, Stop; T	
2 - 43	*55553080	Holder, Damper	
2 - 44	55031430	Damper Assy, Air	
2 - 45	*55241580	Spring, Cassette Holder	
2 - 46	*55810380	Retainer, Cord; A	

EXPLODED VIEW-3



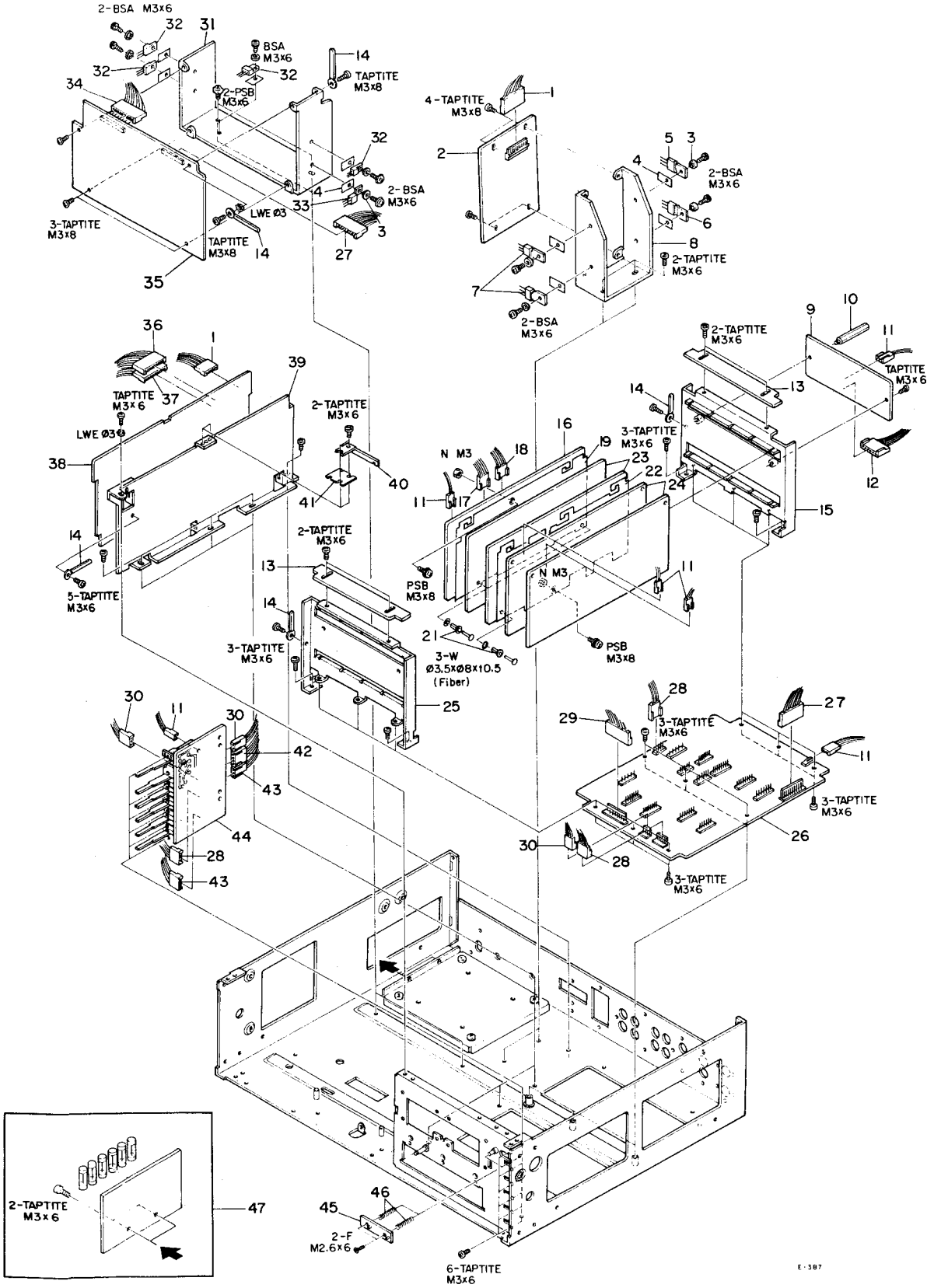
REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
3 - 1	51380050	Key Board Unit	
3 - 2	*51221740	Connector, Socket; 12P	
3 - 3	*55553430	Bracket, Key Board	
3 - 4	*55552710	Spring, Key Board	
3 - 5	*55344960	Cam, Eject	
3 - 6	*55553000	Holder, Eject Cam	
3 - 7	*55447540	Shaft, Eject Cam	
3 - 8	55331350	Counter Assy	
3 - 9	55344970	Belt, Counter; 1	
3 - 10	*55553030	Bracket, Counter	
3 - 11	*55544470	Plate, Micro Switch	
3 - 12	*55553120	Bracket, Micro Switch	
3 - 13	*55544350	Plate, Insulating	
3 - 14	51300040	Switch, Micro	
3 - 15	51300030	Switch, Micro	
3 - 16	55344980	Belt, Counter, 2	
3 - 17	55046110	Reel Table Assy	
3 - 18	55696050	Head, Erase	
3 - 19	*55553110	Plate, Head	
3 - 20	*50831921	Clamp, Head P	
3 - 21	*55810380	Retainer, Cord; A	
3 - 22	*55554160	Bracket, Lamp	
3 - 23	51420890	Lamp, Miniature	
3 - 24	55345070	Screw, Head Mounting	
3 - 25	55696060	Head, REC/PLAY; Dual Gap	
3 - 26	55449260	Screw, Head Mounting; B	
3 - 27	55241410	Spring, Head Adjusting	
3 - 28	55447720	Spacer, Head	
3 - 29	*55045590	Base Assy, Head; Slide	
3 - 30	*55448530	Shaft, Roller	
3 - 31	*55554150	Arm, Roller	
3 - 32	55046370	Bearing	
3 - 33	*55553200	Cover, Base	
3 - 34	*55045600	Lever Assy, Cassette Pressure	
3 - 35	*55241390	Spring, Pressure Lever	
3 - 36	*55552990	Actuator	
3 - 37	*55553190	Lever, Kick	
3 - 38	*55046281	Lever Assy, Eject	
3 - 39	*55241570	Spring, Eject	
3 - 40	*55031420	Base Assy	
3 - 41	71051290	Motor, Reel	
3 - 42	*55554200	Holder	
3 - 43	*55554190	Stopper	
3 - 44	*55554180	Plate, Roller	
3 - 45	*55553450	Bracket, Top Cover; A	
3 - 46	*55021850	Chassis Assy, Mechanism	

EXPLODED VIEW-4



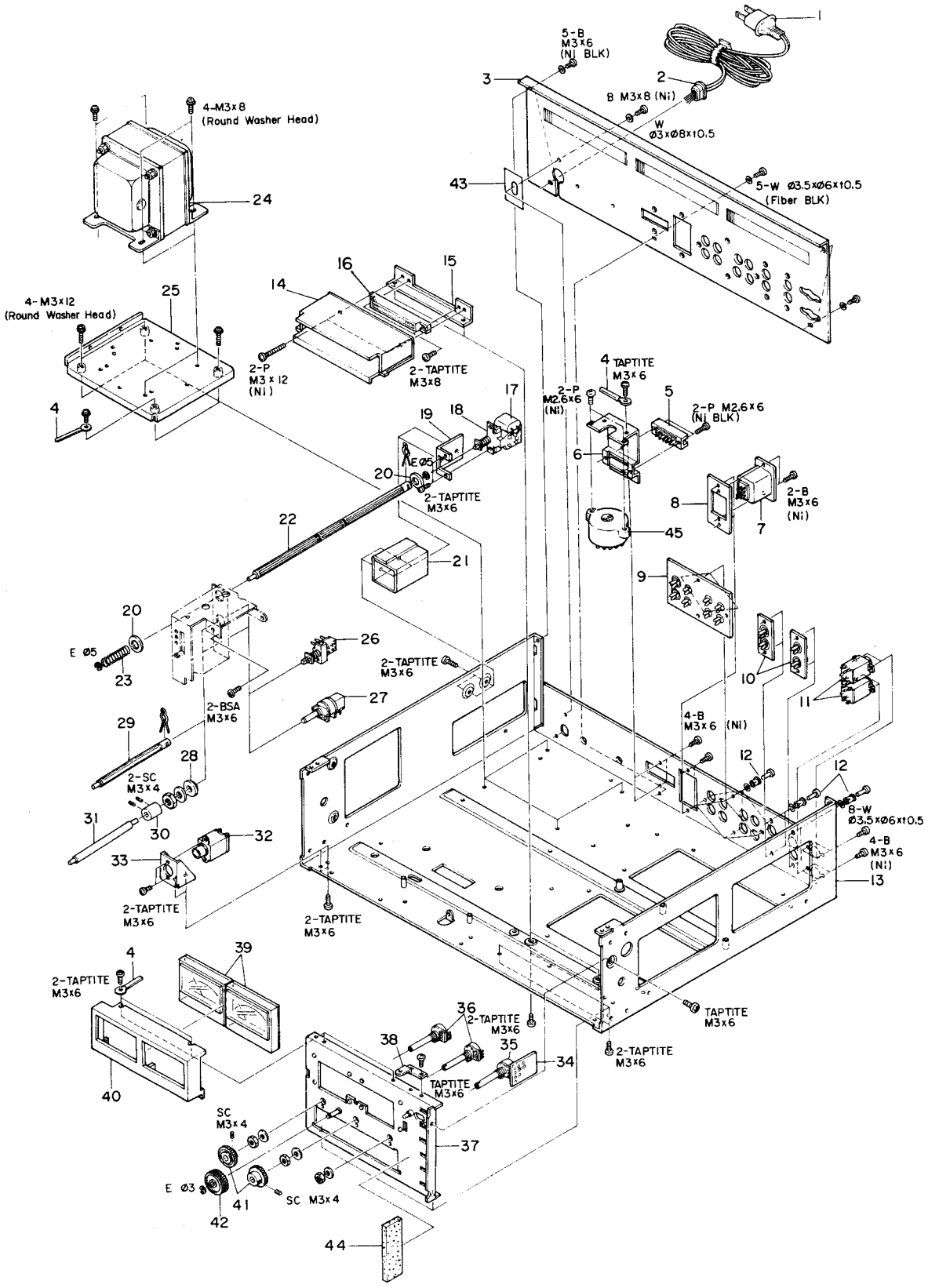
REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
4 - 1	*51430890	Diode, W03C	
4 - 2	51630340	Solenoid, C	
4 - 3	51630330	Solenoid, B	
4 - 4	*55810380	Retainer, Cord; A	
4 - 5	*55345930	Grommet	
4 - 6	*55449080	Spacer, A	
4 - 7	*55553100	Lever, Solenoid; B	
4 - 8	*55553090	Lever, Solenoid; A	
4 - 9	*55447550	Pin, Lever	
4 - 10	*55522770	Bracket, Solenoid	
4 - 11	*55203580	Spring, Pinch Roller Lever	
4 - 12	*55554170	Lever, Pinch Roller; A	
4 - 13	*55554270	Lever, Slide; B	
4 - 14	*55203640	Spring, Slide Lever	
4 - 15	*55554260	Lever, Slide; A	
4 - 16	*55448500	Collar	
4 - 17	*55448520	Collar, B	
4 - 18	*55448510	Collar, A	
4 - 19	*55046101	Lever Assy, Brake; A	
4 - 20	*55552950	Lever, Relay	
4 - 21	*55241860	Spring, Record Preventing; C	
4 - 22	*55554230	Cam, Brake	
4 - 23	55203630	Spring, Brake Cam	
4 - 24	*55448570	Pin, Lever; A	
4 - 25	*55448580	Pin, Lever; B	
4 - 26	*55554250	Lever, Pinch Roller; S	
4 - 27	*55554240	Lever, Pinch Roller; T	
4 - 28	*51687071	PCB Assy, CONNECTING B	
4 - 29		(Not used)	
4 - 30	71051270	Capstan Motor, DC Servo	
4 - 31	*55045560	Bearing Assy, Capstan	
4 - 32	*55532270	Plate Assy, Capstan Supporting	
4 - 33	*55447570	Stud	
4 - 34	*55045621	Lever Assy, Brake; B	
4 - 35	*55553010	Lever	
4 - 36	55345040	Belt, Capstan Drive; A	
4 - 37	55045630	Capstan Assy, T	
4 - 38	55345050	Belt, Capstan Drive; B	
4 - 39	55045580	Capstan Assy, S	
4 - 40	51682380	PCB Assy, HALL-EFFECT ELEMENT	
4 - 41	*55045550	Holder Assy, Relay Pulley	
4 - 42	*55553150	Plate, Lock	
4 - 43	55045570	Holder, Capstan	
4 - 44	55045540	Pulley Assy, Relay; A	
4 - 45	55554130	Ring, Capstan	
4 - 46	*55553020	Bracket, Brake Solenoid	
4 - 47	51630320	Solenoid, A	
4 - 48	*51687061	PCB Assy, CONNECTING	
4 - 49	55203620	Spring, Brake	
4 - 50	*55554220	Plate, Brake	
4 - 51	55300112	Shoe, Brake	

EXPLODED VIEW-5



REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
5 - 1	*55221720	Connector, Socket; 10P	
5 - 2	51687051	PCB Assy, REEL MOTOR CONTROL	
5 - 3	*50332950	Tube, Insulating	
5 - 4	*50332910	Plate, Insulating	
5 - 5	*51450870	Transistor, 2SD313E (Q660)	Part of 5 - 2
5 - 6	*51450910	Transistor, 2SC945AK (Q663)	Part of 5 - 2
5 - 7	*50425370	Transistor, 2SA634L (Q151, Q652)	Part of 5 - 2
5 - 8	*55532390	Heat Sink, B	
5 - 9	51686960	PCB Assy, MIC AMP	
5 - 10	*55449110	Stay, Bracket	
5 - 11	*51221650	Connector, Socket; 3P	
5 - 12	*51221710	Connector, Socket; 9P	
5 - 13	*55553380	Plate, PCB	
5 - 14	*55810380	Retainer, Cord; A	
5 - 15	*55046530	Bracket Assy, A	
5 - 16	51686941	PCB Assy, OSC	
5 - 17	*51222250	Connector, Socket; 6P (BLK)	
5 - 18	*51221680	Connector, Socket; 6P (WHT)	
5 - 19	*55532480	Paper, Shield; B	
5 - 20		(Not used)	
5 - 21	*55345830	Push Rivet, Small	
5 - 22	*55532470	Paper, Shield; A	
5 - 23	51686930	PCB Assy, RECORD AMP	
5 - 24	51686921	PCB Assy, PLAYBACK AMP	
5 - 25	*55522800	Bracket, PCB; A	
5 - 26	51687030	PCB Assy, MOTHER; A	
5 - 27	*51221760	Connector, Socket; 14P	
5 - 28	*51221670	Connector, Socket; 5P	
5 - 29	*51221740	Connector, Socket; 12P	
5 - 30	*51221660	Connector, Socket; 4P	
5 - 31	*55532380	Heat Sink, A	
5 - 32	*51450870	Transistor, 2SD317E (Q910)	Part of 5 - 35
5 - 33	*50425370	Transistor, 2SA634L (Q915)	Part of 5 - 35
5 - 34	*51223470	Connector, Socket; 9P	
5 - 35	51686951	PCB Assy, POWER SUPPLY	
5 - 36	*51222901	Connector, Socket; 12P (RED)	
5 - 37	*51222310	Connector, Socket; 12P (BLK)	
5 - 38	51687041	PCB Assy, CONTROL	
5 - 39	*55522790	Angle, Side	
5 - 40	*55555250	Angle, PCB	
5 - 41	*55553370	Plate, PCB; C	
5 - 42	*51221700	Connector, Socket; 8P (WHT)	
5 - 43	*51222230	Connector, Socket; 4P (BLK)	
5 - 44	*51687021	PCB Assy, LEVER SW	
5 - 45	*51687010	PCB Assy, LED	
	*51677010	PCB, LED	Part of 5 - 45
	51430470	LED (RED)	Part of 5 - 45
5 - 46	*55240820	Spring, LED; B	
5 - 47	*51687080	PCB Assy, FUSE	U.S.A., CANADA
	*51677080	PCB	U.S.A., CANADA
	*50412370	Holder, Fuse	U.S.A., CANADA
	*51420910	Fuse, 250V 3A (F1 ~ F3)	U.S.A., CANADA
	*50411450	Fuse, 250V 1A (F4 ~ F6)	U.S.A., CANADA
	*51687850	PCB Assy, FUSE	EUROPE, U.K., AUSTRALIA
	*51677850	PCB	EUROPE, U.K., AUSTRALIA
	*51420870	Holder, Fuse	EUROPE, U.K., AUSTRALIA
	*50411550	Fuse, 250V 2A (F1)	EUROPE, U.K., AUSTRALIA
	*51421710	Fuse, 250V 2.5A (F2, F3)	EUROPE, U.K., AUSTRALIA
	*50411410	Fuse, 250V 1A (F4 ~ F6)	EUROPE, U.K., AUSTRALIA

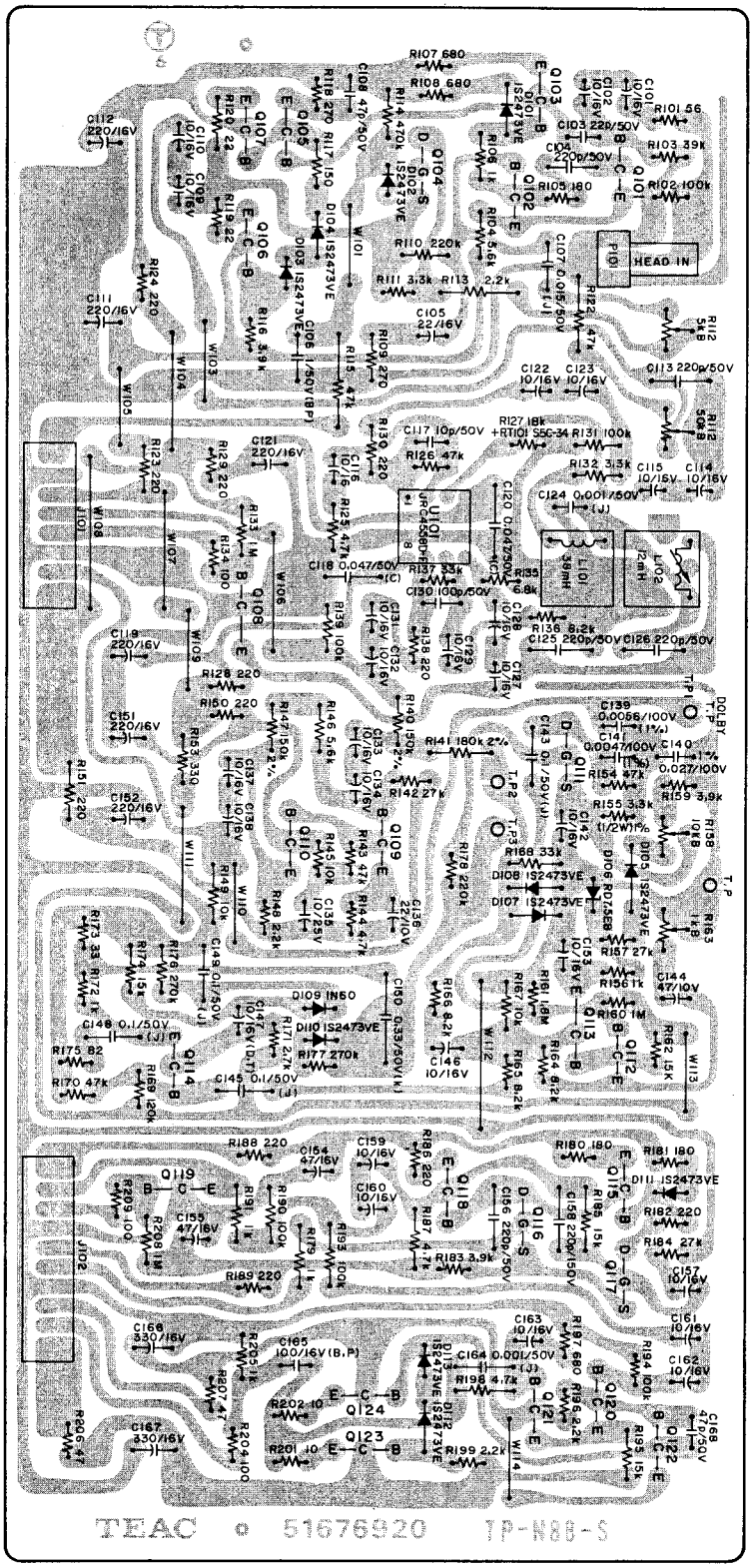
EXPLODED VIEW-6



REF. NO.	PARTS NO.	DESCRIPTION	REMARKS
6 - 1	*51280340	Cord, AC Power	JAPAN, GENERAL EXPORT
	*51280750	Cord, AC Power	U.S.A., CANADA
	*51280170	Cord, AC Power	EUROPE
	*51280350	Cord, AC Power	AUSTRALIA
	*51280400	Cord, AC Power	U.K.
6 - 2	*55300470	Strain Relief, AC Power Cord	All except EUROPE, AUSTRALIA, U.K.
	*55300540	Strain Relief, AC Power Cord	EUROPE, U.K.
	*55342690	Strain Relief, AC Power Cord	AUSTRALIA
6 - 3	*55522880	Chassis, Rear	
6 - 4	*55810380	Retainer, Cord; A	
6 - 5	*50438411	Connector, Socket; 12P	
6 - 6	*55553400	Bracket, Connector; A	
6 - 7	*51223390	Connector, Socket; 6P	
6 - 8	*55553440	Bracket, Connector; B	
6 - 9	*51260280	Terminal Assy, 8P	
6 - 10	*50434632	Jack, Pin; 2P	
6 - 11	51240230	Jack, Phone; Single	
6 - 12	*55341180	Push Rivet	
6 - 13	*55021860	Chassis Assy, Ampl.	
6 - 14	*55031460	Cover Assy, CX-8	
6 - 15	*55553360	Bracket, Connector	
6 - 16	*51223370	Connector, 14P	
6 - 17	*50529050	Spark Killer, 0.1 mfd + 120 ohm 400V AC	JAPAN
	*50529060	Spark Killer, 0.033 mfd + 120 ohm 125V AC	U.S.A.
	*50529110	Spark Killer, 0.033 mfd + 120 ohm 250V AC	CANADA
	*50529070	Spark Killer, 0.01 mfd + 300 ohm 400V AC	GENERAL EXPORT
	*50529080	Spark Killer, 4700 pfd 250V AC	EUROPE
6 - 18	51340460	Switch, Power	All except EUROPE, AUSTRALIA, U.K.
	51340110	Switch, Power	EUROPE, AUSTRALIA, U.K.
6 - 19	*55553390	Bracket, Power Switch	
6 - 20	*55553460	Washer	
6 - 21	*55555960	Cover, Switch	
6 - 22	*55345160	Link, Power Switch	
6 - 23	*55241420	Spring, Link	
6 - 24	51521610	Transformer, Power	JAPAN
	51521620	Transformer, Power	U.S.A., CANADA
	51521650	Transformer, Power	GENERAL EXPORT
	51521660	Transformer, Power	EUROPE, U.K., AUSTRALIA
6 - 25	*55045700	Bracket Assy, Transformer	
6 - 26	51340391	Switch, Push	
6 - 27	51502090	Var. Res., 10 k ohm - B (w/switch)	
6 - 28	*55449040	Collar, D	
6 - 29	*55345170	Link, Connecting	
6 - 30	*55447880	Bush, Connecting	
6 - 31	*55447890	Shaft, Connecting; A	
6 - 32	51240220	Jack, Phone; 3 cond.	
6 - 33	*55553310	Holder, Jack	
6 - 34	*51686971	PCB Assy, OUTPUT VR	
6 - 35	*51502240	Var. Res., 20 k ohm - A x 2	Part of 6 - 34
6 - 36	*51502100	Var. Res., 100 k ohm - A	
6 - 37	*55031450	Chassis Assy, Front	
6 - 38	*55553350	Bracket, Top Cover; B	
6 - 39	51650231	Meter, Peak	
6 - 40	*55331370	Escutcheon, Meter	
6 - 41	55045680	Gear Assy, A	
6 - 42	55045690	Gear Assy, Friction	
6 - 43	*55643930	Mask, Cord	
6 - 44	*55554900	Mask	
6 - 45	*51310070	Selector, Votlage	GENERAL EXPORT

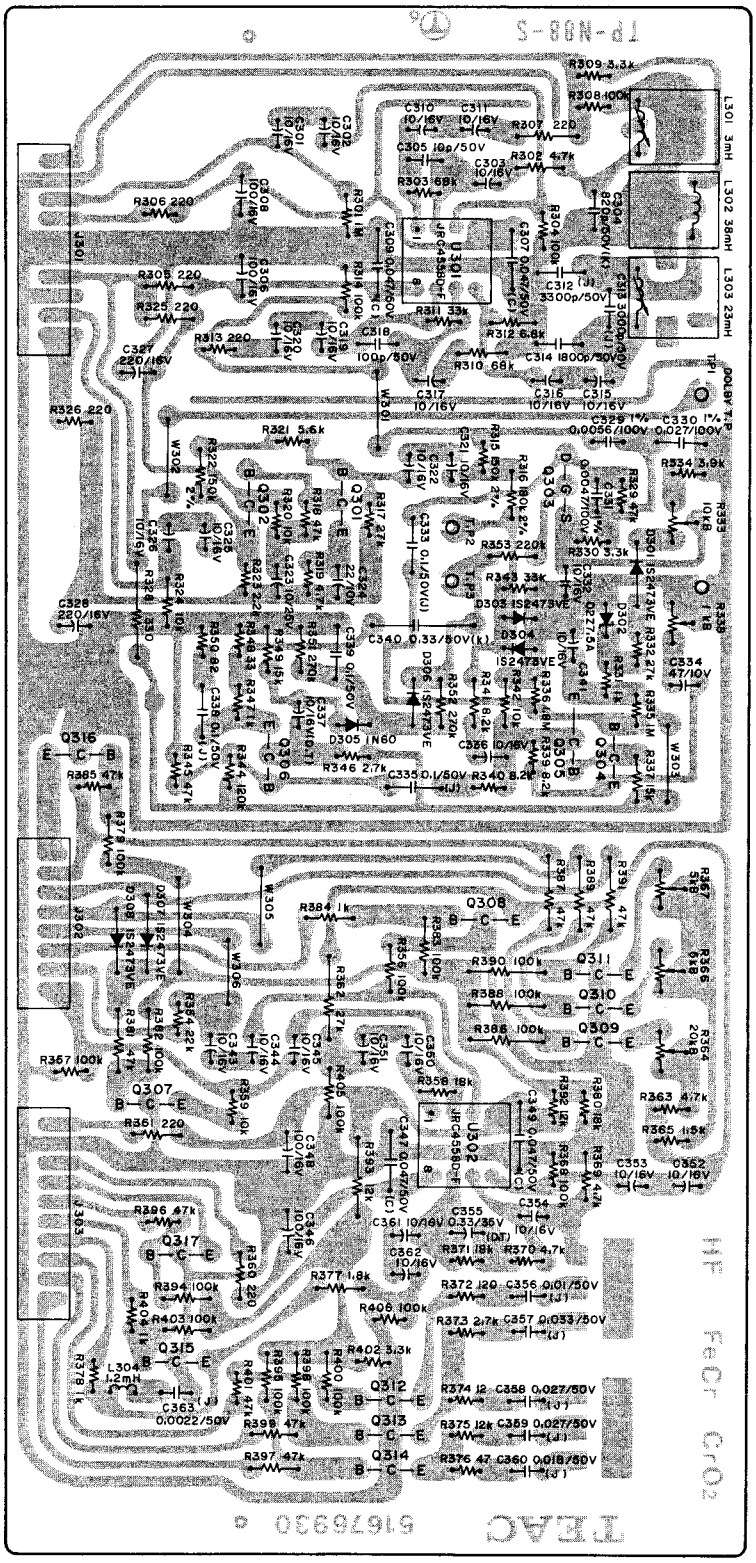
2. PC BOARD SECTION (Diagram)

2-1. PLAYBACK AMP PCB ASSY

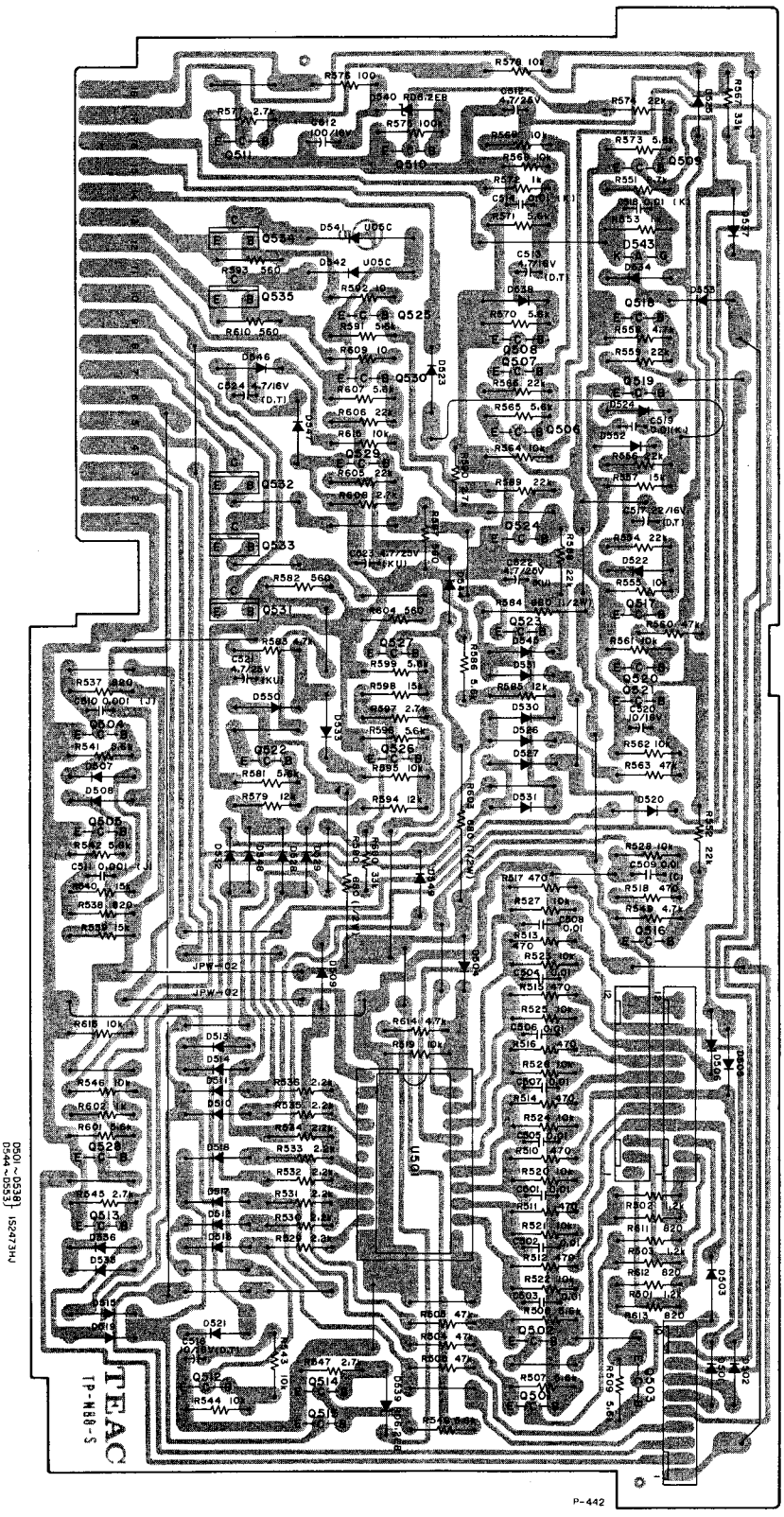


P-440

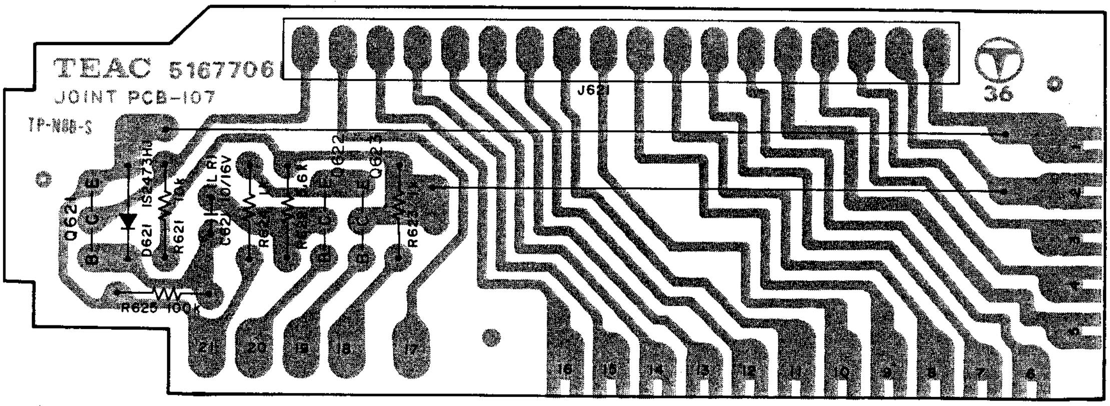
2-2. RECORD AMP PCB ASSY



2-3. CONTROL PCB ASSY

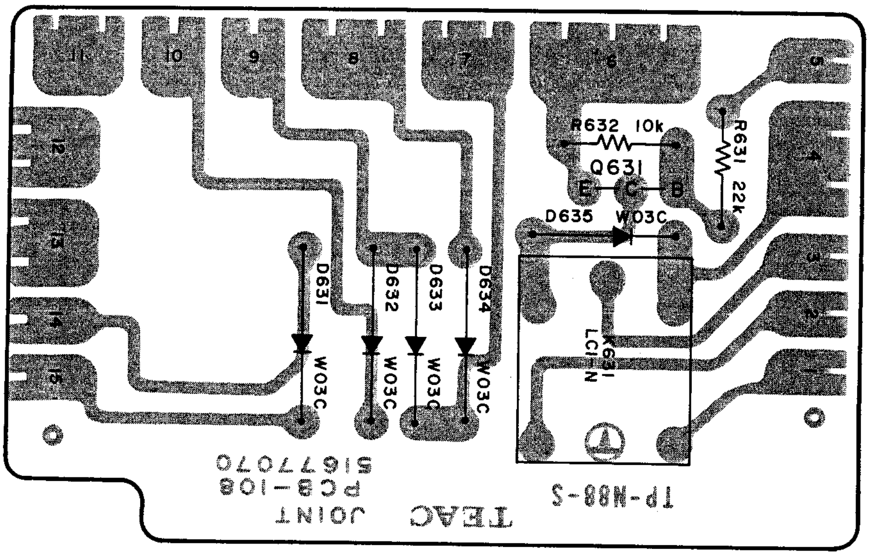


2-4. CONNECTING PCB A ASSY



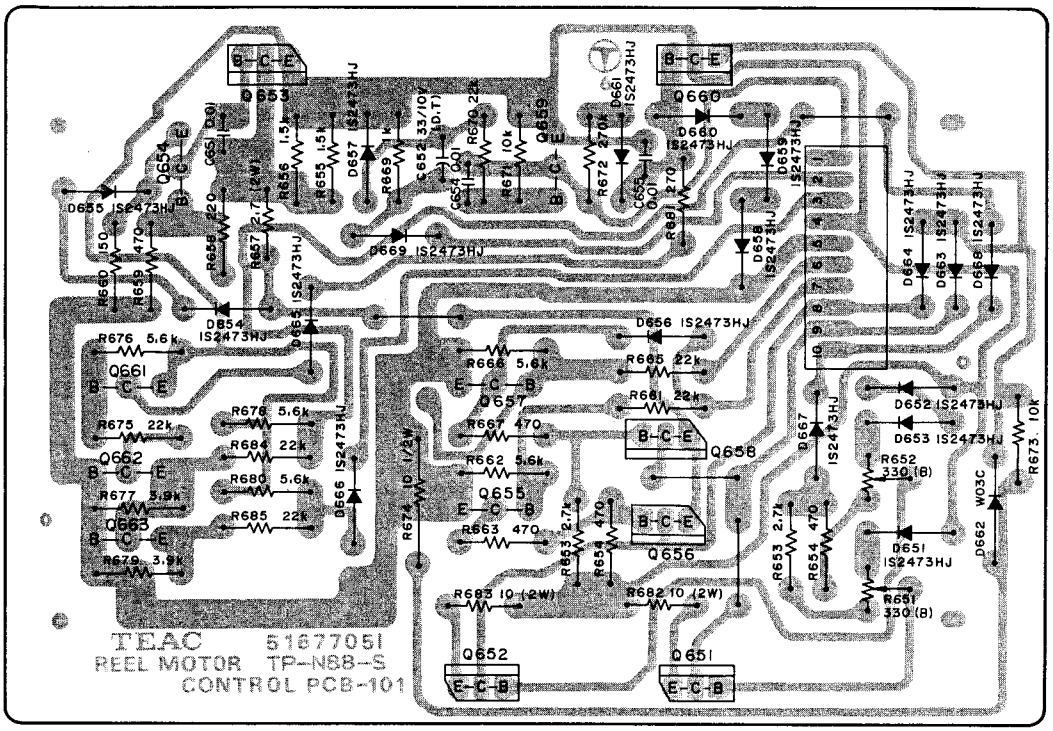
P-443

2-5. CONNECTING PCB B ASSY



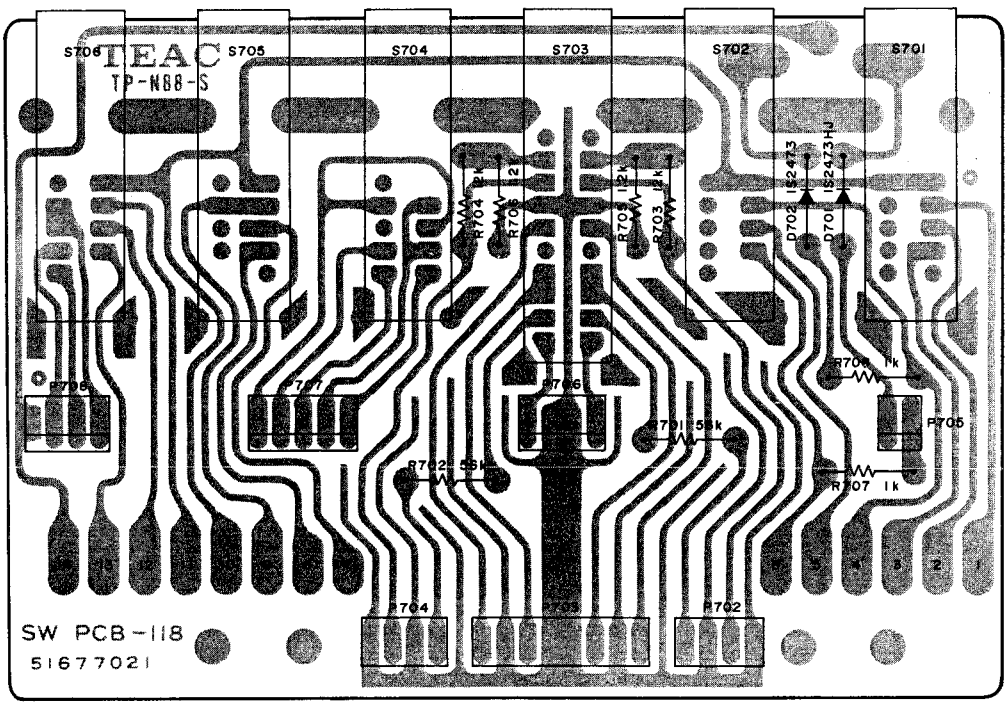
P-444

2-6. REEL MOTOR CONTROL ASSY



P-445

2-7. LEVER SW PCB ASSY



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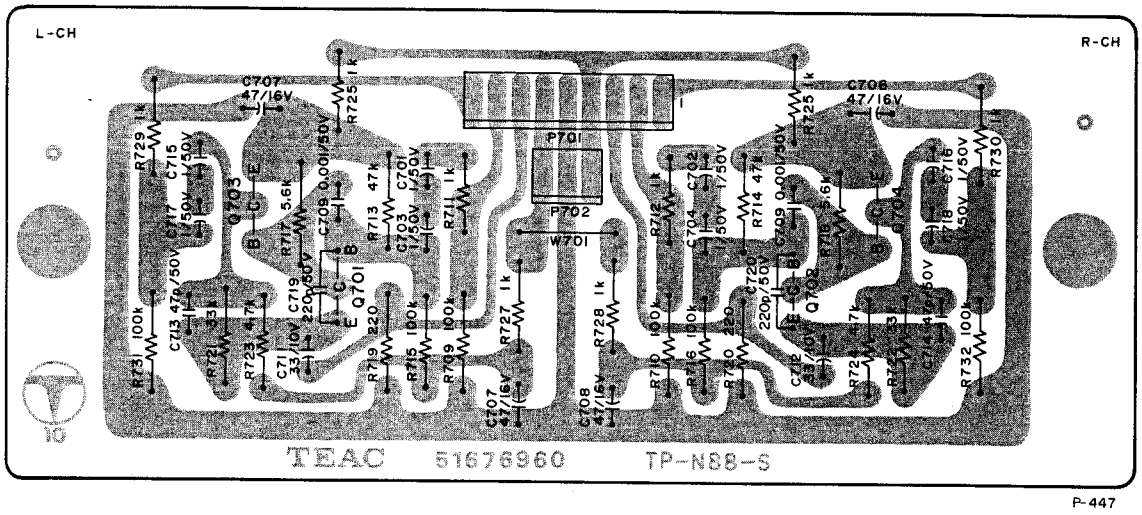
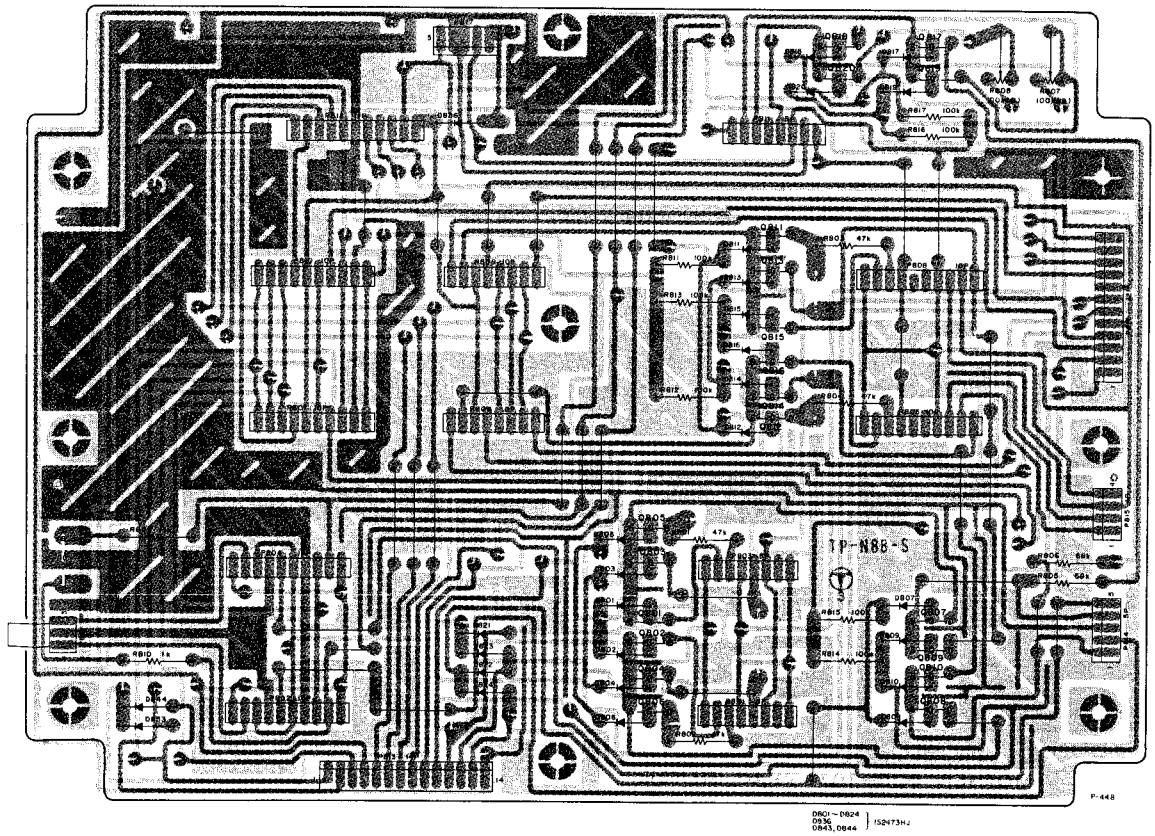
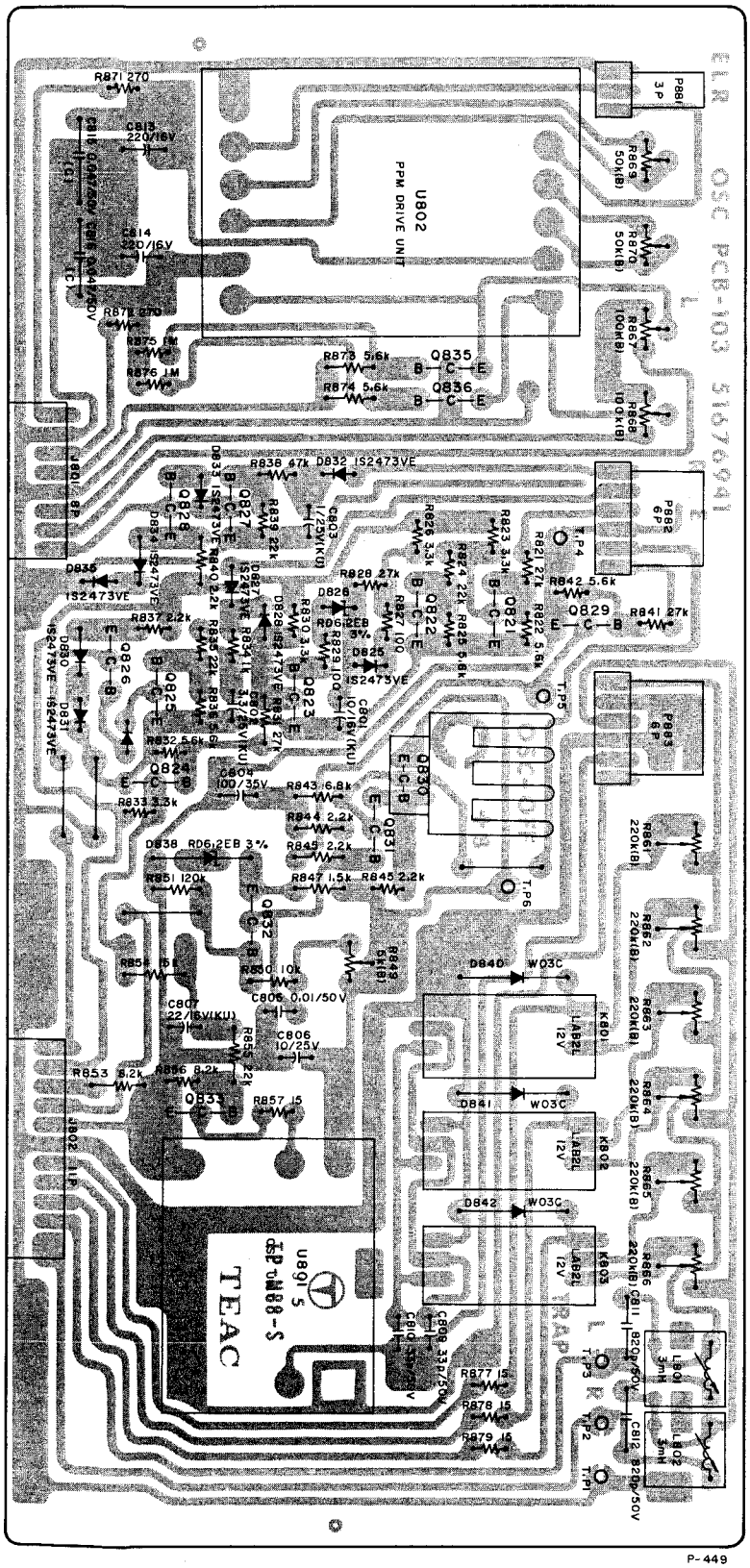
2-8. MIC AMP PCB ASSY



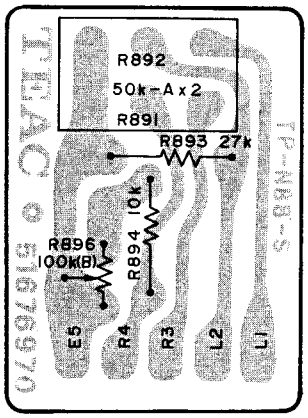
2-9. MOTHER PCB A ASSY



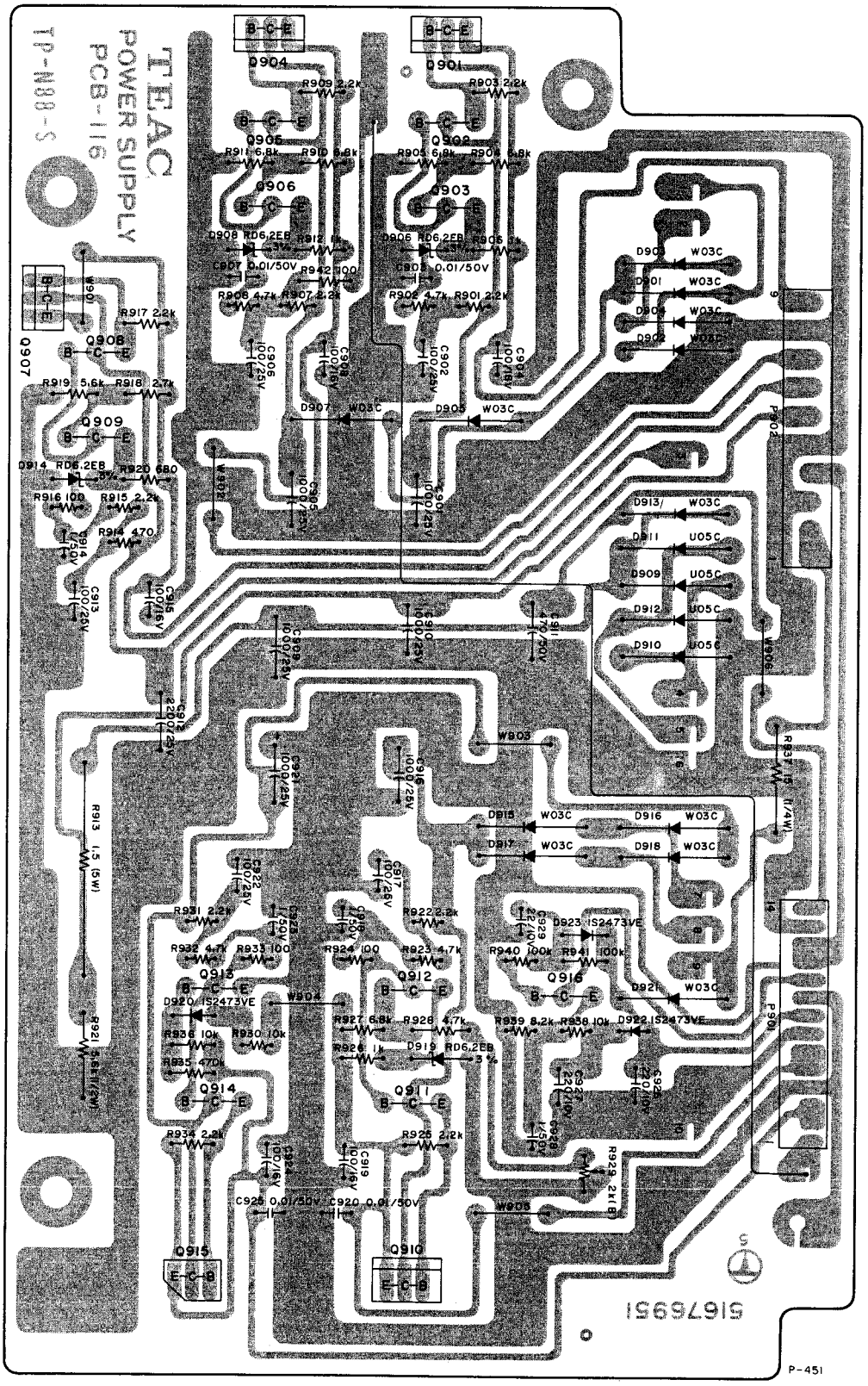
2-10. OSC PCB ASSY



2-11. OUTPUT VR PCB ASSY



2-12. POWER SUPPLY PCB ASSY



2. PC BOARD SECTION (Parts List)

2-1. PLAYBACK AMP PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686921	PCB Assy
	51676920	PCB
	IC	
U101	51470240	JRC4558D-F
	TRANSISTORS	
Q101, Q102	51451170	2SA991F
Q103	50424950	2SC1222E
Q104	51451030	FET, 2SK68AM
Q105	50424950	2SC1222E
Q106	50424750	2SC1384Q
Q107	50424900	2SA684Q
Q108	51450860	2SC1636-2
Q109, Q110	50424860	2SC536G
Q111	57240991	FET, 2SK30DB
Q112	50424860	2SC536G
Q113	50425530	2SA733P
Q114	50424860	2SC536G
Q115	51450380	2SA750E
Q116, Q117	51451030	FET, 2SK68AM
Q118	51450380	2SA750E
Q119	51450860	2SC1636-2
Q120, Q121	51450380	2SA750E
Q122	50424950	2SC1222E
Q123	50424750	2SC1384Q
Q124	50424900	2SA684Q
	DIODES	
D101~D105	50425170	1S2473VE
D106	51431220	Zener, RD7.5EB
D107, D108	50425170	1S2473VE
D109	50422130	1N60
D110~D113	50425170	1S2473VE
	RESISTORS	
	All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.	
R101	50570520	56 ohm
R102	50571300	100 k ohm
R103	50571200	39 k ohm
R104	50571000	5.6 k ohm
R105	50570640	180 ohm
R106	50570820	1 k ohm
R107, R108	50570780	680 ohm
R109	50570680	270 ohm
R110	50571380	220 k ohm
R111	50570940	3.3 k ohm
R113	50570900	2.2 k ohm
R114	50571460	470 k ohm
R115	50571220	47 k ohm
R116	50570960	3.9 k ohm
R117	50570620	150 ohm
R118	50570680	270 ohm
R119, R120	50570420	22 ohm
R122	50571220	47 k ohm
R123, R124	50570660	220 ohm
R125	50570980	4.7 k ohm
R126	50571240	56 k ohm
R127	51815120	18 k ohm

REF. NO.	PARTS NO.	DESCRIPTION
R128~R130	50570660	220 ohm
R131	50571300	100 k ohm
R132	50570940	3.3 k ohm
R133	50571540	1 M ohm
R134	50570580	100 ohm
R135	50571020	6.8 k ohm
R136	50571040	8.2 k ohm
R137	50571180	33 k ohm
R138	50570660	220 ohm
R139	50571300	100 k ohm
R140	51813850	Metal Film 150 k ohm 2%
R141	51813860	Metal Film 180 k ohm 2%
R142	50571160	27 k ohm
R143	50571220	47 k ohm
R144	50570980	4.7 k ohm
R145	50571060	10 k ohm
R146	50571000	5.6 k ohm
R147	51813850	Metal Film 150 k ohm 2%
R148	50570900	2.2 k ohm
R149	50571060	10 k ohm
R150, R151	50570660	220 ohm
R153	50570700	330 ohm
R154	50571220	47 k ohm
R155	51813910	Metal Film 3.3 k ohm ½W 1%
R156	50570820	1 k ohm
R157	50571160	27 k ohm
R159	50570960	3.9 k ohm
R160	50571540	1 M ohm
R161	50571590	1.8 M ohm
R162	50571100	15 k ohm
R164~R166	50571040	8.2 k ohm
R167	50571060	10 k ohm
R168	50571180	33 k ohm
R169	50571320	120 k ohm
R170	50571220	47 k ohm
R171	50570920	2.7 k ohm
R172	50570820	1 k ohm
R173	50570460	33 ohm
R174	50571100	15 k ohm
R175	50570560	82 ohm
R176, R177	50571400	270 k ohm
R178	50571380	220 k ohm
R179	50570820	1 k ohm
R180, R181	50570640	180 ohm
R182	50570660	220 ohm
R183	50570960	3.9 k ohm
R184	50571160	27 k ohm
R185	50571100	15 k ohm
R186	50570660	220 ohm
R187	50570980	4.7 k ohm
R188, R189	50570660	220 ohm
R190	50571300	100 k ohm
R191	50570820	1 k ohm
R193, R194	50571300	100 k ohm
R195	50571100	15 k ohm
R196	50570900	2.2 k ohm
R197	50570780	680 ohm
R198	50570980	4.7 k ohm
R199	50570900	2.2 k ohm
R201, R202	50570340	10 ohm
R204	50570580	100 ohm
R205	50570820	1 k ohm
R206, R207	50570500	47 ohm
R208	50571540	1 M ohm
R209	50570580	100 ohm

REF. NO.	PARTS NO.	DESCRIPTION
		CAPACITORS
C101, C102	50554050	Elec. 10 mfd 16V
C103	50543820	Dip. Mica 22 pfd 50V
C104	50547450	Dip. Mica 220 pfd 50V
C105	50554880	Elec. 22 mfd 16V
C106	50559420	Elec. 1 mfd 50V (Bi-polar)
C107	50548870	Mylar 0.015 mfd 50V 5%
C108	50547420	Dip. Mica 47 pfd 50V
C109, C110	50554050	Elec. 10 mfd 16V
C111, C112	50554390	Elec. 220 mfd 16V
C113	50547450	Dip. Mica 220 pfd 50V
C114~C116	50554050	Elec. 10 mfd 16V
C117	50547400	Dip. Mica 10 pfd 50V
C118	50542300	Ceramic 0.047 mfd 50V 5%
C119	50554390	Elec. 220 mfd 16V
C120	50542300	Ceramic 0.047 mfd 50V 5%
C121	50554390	Elec. 220 mfd 16V
C122, C123	50554050	Elec. 10 mfd 16V
C124	50548780	Mylar 0.001 mfd 50V 5%
C125, C126	50547450	Dip. Mica 220 pfd 50V
C127~C129	50554050	Elec. 10 mfd 16V
C130	50547440	Dip. Mica 100 pfd 50V
C131~C134	50554050	Elec. 10 mfd 16V
C135	50554040	Elec. 10 mfd 25V
C136	50554720	Elec. 22 mfd 10V
C137, C138	50554050	Elec. 10 mfd 16V
C139	51700130	Meta. Polyst. 0.0056 mfd 100V 1%
C140	51700140	Meta. Polyst. 0.027 mfd 100V 1%
C141	51700120	Meta. Polyst. 0.0047 mfd 100V 1%
C142	50554050	Elec. 10 mfd 16V
C143	50548040	Mylar 0.1 mfd 50V 10%
C144	50555540	Elec. 47 mfd 10V
C145	50548040	Mylar 0.1 mfd 50V 10%
C146	50554050	Elec. 10 mfd 16V
C147	50546561	Dip. Tant. 10 mfd 16V
C148	50549280	Mylar 0.1 mfd 50V 5%
C149	50548040	Mylar 0.1 mfd 50V 10%
C150	50548830	Meta. Mylar 0.33 mfd 50V 10%
C151, C152	50554390	Elec. 220 mfd 16V
C153	50554050	Elec. 10 mfd 16V
C154, C155	50554010	Elec. 47 mfd 16V
C156	50547450	Dip. Mica 220 pfd 50V
C157	50554050	Elec. 10 mfd 16V
C158	50547450	Dip. Mica 220 pfd 50V
C159~C163	50554050	Elec. 10 mfd 16V
C164	50548780	Mylar 0.001 mfd 50V 5%
C165	50559300	Elec. 100 mfd 16V (Bi-polar)
C166, C167	50554840	Elec. 330 mfd 16V
C168	50547420	Dip. Mica 47 pfd 50V
		VARIABLE RESISTORS
R112	51501530	Semi-fixed, 5 k ohm - B
R121	51501560	Semi-fixed, 50 k ohm - B
R158	51501540	Semi-fixed, 10 k ohm - B
R163	51501510	Semi-fixed, 1 k ohm - B
		COILS
L101	50566660	Choke, 38 mH
L102	51600430	Trap, 12 mH

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS
	51431280	Thermistor, S5C-34
J101	51223790	Connector, Socket; 8P
J102	51223810	Connector, Socket; 10P
P101	51221460	Connector, 3P
W101	51817630	Jumper
W103~W114	51817630	Jumper
	57240420	Pin, F3 type (8 used)

2-2. RECORD AMP PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686930	PCB Assy
	51676930	PCB
		IC's
U301, U302	51470240	JRC4558D-F
		TRANSISTORS
Q301, Q302	50424860	2SC536G
Q303	57240991	FET, 2SK30DB
Q304	50424860	2SC536G
Q305	50425530	2SA733P
Q306~Q317	50424860	2SC536G
		DIODES
D301	50425170	1S2473VE
D302	51431220	Zener, RD7.5EB
D303, D304	50425170	1S2473VE
D305	50422130	1N60
D306~D308	50425170	1S2473VE
		RESISTORS **All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.**
R301	50571540	1 M ohm
R302	50570980	4.7 k ohm
R303	50571260	68 k ohm
R304	50571300	100 k ohm
R305~R307	50570660	220 ohm
R308	50571300	100 k ohm
R309	50570940	3.3 k ohm
R310	50571260	68 k ohm
R311	50571180	33 k ohm
R312	50571020	6.8 k ohm
R313	50570660	220 ohm
R314	50571300	100 k ohm
R315	51813850	Metal Film, 150 k ohm 2%
R316	51813860	Metal Film, 180 k ohm 2%
R317	50571160	27 k ohm
R318	50571220	47 k ohm
R319	50570980	4.7 k ohm

REF. NO.	PARTS NO.	DESCRIPTION
R320	50571060	10 k ohm
R321	50571000	5.6 k ohm
R322	51803850	Metal Film, 150 k ohm 2%
R323	50570900	2.2 k ohm
R324	50571060	10 k ohm
R325, R326	50570660	220 ohm
R328	50570700	330 ohm
R329	50571220	47 k ohm
R330	51813910	Metal Film, 3.3 k ohm ½W 1%
R331	50570820	1 k ohm
R332	50571160	27 k ohm
R334	50570960	3.9 k ohm
R335	50571540	1 M ohm
R336	50571590	1.8 M ohm
R337	50571100	15 k ohm
R339~R341	50571040	8.2 k ohm
R342	50571060	10 k ohm
R343	50571180	33 k ohm
R344	50571320	120 k ohm
R345	50571220	47 k ohm
R346	50570920	2.7 k ohm
R347	50570820	1 k ohm
R348	50570460	33 ohm
R349	50571100	15 k ohm
R350	50570560	82 ohm
R351, R352	50571400	270 k ohm
R353	50571380	220 k ohm
R354	50571140	22 k ohm
R356, R357	50571300	100 k ohm
R358	50571120	18 k ohm
R359	50571060	10 k ohm
R360, R361	50570660	220 ohm
R362	50571160	27 k ohm
R363	50570980	4.7 k ohm
R365	50570860	1.5 k ohm
R368	50571300	100 k ohm
R369, R370	50570980	4.7 k ohm
R371	50571120	18 k ohm
R372	50570600	120 ohm
R373	50570920	2.7 k ohm
R374	50570360	12 ohm
R375	50571080	12 k ohm
R376	50570500	47 ohm
R377	50570880	1.8 k ohm
R378	50570820	1 k ohm
R379	50571300	100 k ohm
R380	50571120	18 k ohm
R381	50571220	47 k ohm
R382	50571300	100 k ohm
R383, R384	50570820	1 k ohm
R385	50571220	47 k ohm
R386	50571300	100 k ohm
R387	50571220	47 k ohm
R388	50571300	100 k ohm
R389	50571220	47 k ohm
R390	50571300	100 k ohm
R391	50571220	47 k ohm
R392, R393	50571080	12 k ohm
R394, R395	50571300	100 k ohm
R396, R397	50571220	47 k ohm
R398	50571300	100 k ohm
R399	50571220	47 k ohm
R400	50571300	100 k ohm

REF. NO.	PARTS NO.	DESCRIPTION
R401	50571220	47 k ohm
R402	50570940	3.3 k ohm
R403	50571300	100 k ohm
R404	50570820	1 k ohm
R405, R406	50571300	100 k ohm

CAPACITORS

C301~C303	50554050	Elec.	10 mfd	16V
C304	50543440	Polyst.	820 pfd	50V 10%
C305	50547400	Dip. Mica	10 pfd	50V
C306	50554200	Elec.	100 mfd	16V
C307	50542300	Ceramic	0.047 mfd	50V
C308	50554200	Elec.	100 mfd	16V
C309	50542300	Ceramic	0.047 mfd	50V
C310, C311	50554050	Elec.	10 mfd	16V
C312	50596800	Polyst.	3300 pfd	50V 5%
C313	50596810	Polyst.	3000 pfd	50V 5%
C314	50543990	Polyst.	1800 pfd	50V 5%
C315~D317	50554050	Elec.	10 mfd	16V
C318	50547440	Dip. Mica	100 pfd	50V
C319~C322	50554050	Elec.	10 mfd	16V
C323	50554040	Elec.	10 mfd	25V
C324	50554720	Elec.	22 mfd	10V
C325, C326	50554050	Elec.	10 mfd	16V
C327, C328	50554390	Elec.	220 mfd	16V
C329	51700130	Meta. Polyst.	0.0056 mfd	100V 1%
C330	51700140	Meta. Mylar	0.027 mfd	100V 1%
C331	51700120	Meta. Mylar	0.0047 mfd	100V 1%
C332	50554050	Elec.	10 mfd	16V
C333	50549280	Mylar	0.1 mfd	50V 5%
C334	50555540	Elec.	47 mfd	10V
C335	50549280	Mylar	0.1 mfd	50V 5%
C336	50554050	Elec.	10 mfd	16V
C337	50546561	Dip. Tant.	10 mfd	16V
C338, C339	50549280	Mylar	0.1 mfd	50V 5%
C340	50548830	Meta. Mylar	0.33 mfd	50V 10%
C341~C345	50554050	Elec.	10 mfd	16V
C346	50554200	Elec.	100 mfd	16V
C347	50542300	Ceramic	0.047 mfd	50V
C348	50554200	Elec.	100 mfd	16V
C349	50542300	Ceramic	0.047 mfd	50V
C350~C354	50554050	Elec.	10 mfd	16V
C355	51703000	Dip. Tant.	0.33 mfd	35V
C356	50548770	Mylar	0.01 mfd	50V 5%
C357	50549000	Mylar	0.033 mfd	50V 5%
C358, C359	50548990	Mylar	0.027 mfd	50V 5%
C360	50548970	Mylar	0.018 mfd	50V 5%
C361, C362	50554050	Elec.	10 mfd	16V
C363	50548760	Mylar	0.0022 mfd	50V 5%

VARIABLE RESISTORS

R333	51501540	Semi-fixed, 10 k ohm - B
R338	51501510	Semi-fixed, 1 k ohm - B
R364	51501550	Semi-fixed, 10 k ohm - B
R366, R367	51501530	Semi-fixed, 5 k ohm - B

COILS

L301	51600440	Trap, 3 mH
L302	50566660	Choke, 38 mH
L303	50566650	Tap, 23 mH
L304	50566611	Choke, 1.2 mH

REF. NO.	PARTS NO.	DESCRIPTION
	MISCELLANEOUS	
J301	51223810	Connector, Socket; 10P
J302	51223790	Connector, Socket; 8P
J303	51223810	Connector, Socket; 10P
W301~W305	51817630	Jumper
	57240420	Pin, F3 type (8 used)
	51686980	PCB Assy, PEAKING COIL
	51676980	PCB
L305	50566350	Coil, Record EQ; 8 mH
L306	51600410	Coil, Record EQ; 2.4 mH
L307	51600420	Coil, Record EQ; 3.6 mH

2-3. CONTROL PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687041	PCB Assy
	51677041	PCB
	IC	
U501	51470500	LSI, YM-27600
	TRANSISTORS	
Q501~Q505	51450910	2SC945AK
Q506	50425530	2SA733P
Q507, Q508	51450910	2SC945AK
Q509	50425530	2SA733P
Q510~Q515	51450910	2SC945AK
Q516	50425530	2SA733P
Q517	51450910	2SC945AK
Q518	50425530	2SA733P
Q519~Q521	51450910	2SC445AK
Q522, Q523	50426250	2SC1318S
Q524	51450910	2SC945AK
Q525	51450430	2SA720Q
Q526	51420910	2SC945AK
Q527	50426250	2SC1318S
Q528, Q529	51420910	2SC945AK
Q530	51450430	2SA720Q
Q531~Q535	51450870	2SD313E
	DIODES	
D501~D538	51431180	1S2473HJ
D539, D540	50425540	Zener, RD6.2EB
D541, D542	51430170	U0-5C
D543	51431230	SCR, 03P05M
D544~D553	51431180	1S2473HJ

REF. NO.	PARTS NO.	DESCRIPTION
	CARBON RESISTORS **All resistors are rated ±5% tolerance and ¼ watt unless otherwise noted.**	
R501~R503	51830850	1.2 k ohm
R504~R506	51831220	47 k ohm
R507~R509	51831000	5.6 k ohm
R510~R518	51830740	470 ohm
R519~R528	51831060	10 k ohm
R529~R536	51830900	2.2 k ohm
R537, R538	51830800	820 ohm
R539, R540	51831100	15 k ohm
R541, R542	51831000	5.6 k ohm
R543, R544	51831060	10 k ohm
R545	51830920	2.7 k ohm
R546	51831060	10 k ohm
R547	51830920	2.7 k ohm
R548	51831000	5.6 k ohm
R549	51830980	4.7 k ohm
R551	51830920	2.7 k ohm
R552	51831140	22 k ohm
R553	51830820	1 k ohm
R554	51831140	22 k ohm
R555	51831060	10 k ohm
R556	51831140	22 k ohm
R557	51831100	15 k ohm
R558	51830980	4.7 k ohm
R559	51831140	22 k ohm
R560	51831220	47 k ohm
R561, R562	51831060	10 k ohm
R563	51831220	47 k ohm
R564	51831060	10 k ohm
R565	51831000	5.6 k ohm
R566	51831140	22 k ohm
R567	51831180	33 k ohm
R568, R569	51831060	10 k ohm
R570, R571	51831000	5.6 k ohm
R572	51830820	1 k ohm
R573	51831000	5.6 k ohm
R574	51831140	22 k ohm
R575	51831300	100 k ohm
R576	51830580	100 ohm
R577	51830920	2.7 k ohm
R578	51831060	10 k ohm
R579	51831080	12 k ohm
R580	50574780	680 ohm ½W
R581	51831000	5.6 k ohm
R582	51830760	560 ohm
R583	51830980	4.7 k ohm
R584	50574780	680 ohm ½W
R585	51831080	12 k ohm
R586	51831000	5.6 k ohm
R587	51830760	560 ohm
R588, R589	51831140	22 k ohm
R590, R591	51831000	5.6 k ohm
R592	51830440	10 ohm
R593	51830760	560 ohm
R574	51831080	12 k ohm
R595	51831060	10 k ohm
R596	51831000	5.6 k ohm
R597	51830920	2.7 k ohm
R598	51831100	15 k ohm
R599	51831000	5.6 k ohm

REF. NO.	PARTS NO.	DESCRIPTION
R600	51831180	33 k ohm
R601	51831000	5.6 k ohm
R602	51830820	1 k ohm
R603	50574780	680 ohm ½W
R604	51830760	560 ohm
R605, R606	51831140	22 k ohm
R607, R608	51831000	5.6 k ohm
R609	51830340	10 ohm
R610	51830760	560 ohm
R611~R613	51830800	820 ohm
R614	51830980	4.7 k ohm
R615, R616	51831060	10 k ohm
	CAPACITORS	
C501~C509	50542040	Ceramic 0.01 mfd 50V
C510, C511	50548785	Mylar 0.001 mfd 50V 5%
C512	50554530	Elec. 4.7 mfd 25V
C513	50546541	Dip. Tant. 4.7 mfd 16V
C514	50548020	Mylar 0.01 mfd 50V 10%
C515	50554200	Elec. 100 mfd 16V
C516	50546561	Dip. Tant. 10 mfd 16V
C517	50546581	Dip. Tant. 22 mfd 16V
C518, C519	50548020	Mylar 0.01 mfd 50V 10%
C520	50554050	Elec. 10 mfd 16V
C521~C523	50549690	Elec. 4.7 mfd 25V (KU)
C524	50546541	Dip. Tant. 4.7 mfd 16V
	MISCELLANEOUS	
	51470410	Socket, LSI; 24P
J501	51223091	Connector, Plug; 12P (RED)
J502	51221930	Connector, Plug; 12P (BLK)
J503	51221340	Connector, Plug; 10P (WHT)
	51817630	Jumper (30 used)
	51817670	Jumper (6 used)
	51812090	Jumper, JPW-02 (2 used)
	51817650	Jumper (2 used)

2-4. CONNECTING PCB A ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687061	PCB Assy
	51677061	PCB
	TRANSISTORS	
Q621~Q623	51450910	2SC945AK
	DIODE	
D621	51431180	1S2473HJ
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R621	51831060	10 k ohm
R622	51831000	5.6 k ohm
R623, R624	51830820	1 k ohm
R625	51831300	100 k ohm
	CAPACITOR	
C621	51700770	Elec. 10 mfd 16V (LR)
	MISCELLANEOUS	
J621	51223380	Connector, 18P

2-5. CONNECTING PCB B ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687071	PCB Assy
	51677070	PCB
Q631	51450820	Transistor, 2SC2060Q
D631~D635	51430890	Diode, W03C
R631	51831140	Resistor, Carbon; 22 k ohm ¼W 5%
R632	51831060	Resistor, Carbon; 10 k ohm ¼W 5%
K631	50611390	Relay, Sub-miniature; LC1-N 12V

2-6. REEL MOTOR CONTROL ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687051	PCB Assy
	51677051	PCB
	TRANSISTORS	
Q651~Q653	50425370	2SA634L
Q654, Q655	51450910	2SC945AK
Q656	50425370	2SA634L
Q657	51450910	2SC945AK
Q658	50425370	2SA634L
Q659	50425530	2SA733P
Q660	51450870	2SD313E
Q661	50425530	2SA733P
Q662, Q663	51450910	2SC945AK
	DIODES	
D651~D661	51331180	1S2473HJ
D662	51430890	W03C
D663~D669	51431180	1S2473HJ

REF. NO.	PARTS NO.	DESCRIPTION
	RESISTORS	
	All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.	
R653	51830920	2.7 k ohm
R654	51830740	470 ohm
R655, R656	51830860	1.5 k ohm
R657	51806200	Wire Wound, 2.7 ohm 2W
R658	51830660	220 ohm
R659	51830740	470 ohm
R660	51830620	150 ohm
R661	51831140	22 k ohm
R662	51831000	5.6 k ohm
R663	51830740	470 ohm
R664	51831060	10 k ohm
R665	51831140	22 k ohm
R666	51831000	5.6 k ohm
R667	51830740	470 ohm
R668	51831060	10 k ohm
R669	51830820	1 k ohm
R670	51831140	22 k ohm
R671	51831060	10 k ohm
R672	51830680	270 ohm
R673	51831060	10 k ohm
R674		10 ohm ½W
R675	51831140	22 k ohm
R676	51831000	5.6 k ohm
R677	51830960	3.9 k ohm
R678	51831000	5.6 k ohm
R679	51830960	3.9 k ohm
R680	51831000	5.6 k ohm
R681	51830680	270 ohm
R682, R683	51806340	Wire Wound, 10 ohm 2W
R684, R685	51831140	22 k ohm
	CAPACITORS	
C651	50542040	Ceramic 0.01 mfd 50V
C652	50546511	Dip. Tant. 33 mfd 10V
C653	50546561	Elec. 10 mfd 16V
C654, C655	50542040	Ceramic 0.01 mfd 50V
	VARIABLE RESISTORS	
R651, R652	50536140	Semi-fixed, 330 ohm - B
	MISCELLANEOUS	
J651	51221530	Connector, Plug; 10P
	51817630	Jumper (4 used)

2-7. LEVER SW PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687021	PCB Assy
	51677021	PCB
	DIODES	
D701	51431180	1S2473HJ
D702	50425500	1S2473
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R701, R702	51831240	56 k ohm
R703, R704	51831080	12 k ohm
R705, R706	51830840	1.2 k ohm
R707, R708	51830820	1 k ohm
	SWITCHES	
S701, S702	51320420	Lever, DP3T
S703	51320430	Lever, 4P3T
S704~S706	51320410	Lever, DP3T
	MISCELLANEOUS	
P702	51221470	Connector, 4P (WHT)
P703	51221510	Connector, 8P (WHT)
P704	51222040	Connector, 4P (BLK)
P705	51221260	Connector, 2P (WHT)
P706	51221280	Connector, 4P (WHT)
P707	51221290	Connector, 5P (WHT)
P708	51221850	Connector, 4P (BLK)

2-8. MIC AMP PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686960	PCB Assy
	51676960	PCB
	TRANSISTORS	
Q701, Q702	50424950	2SC1222E
Q703, Q704	51450380	2SA750E
	CARBON RESISTORS	
	All resistors are rated ±5% tolerance and ¼ watt.	
R709, R710	51831300	100 k ohm
R711, R712	51830820	1 k ohm
R713, R714	51831220	47 k ohm
R715, R716	51831300	100 k ohm
R717, R718	51831000	5.6 k ohm
R719, R720	51830660	220 ohm
R721, R722	51831180	33 k ohm
R723, R724	51830980	4.7 k ohm
R725, R726	51830820	1 k ohm
R727, R728	51830820	1 k ohm

REF. NO.	PARTS NO.	DESCRIPTION		
R729, R730	51830820	1 k ohm		
R731, R732	51831300	100 k ohm		
		CAPACITORS		
C701, C702	50554540	Elec.	1 mfd	50V
C703, C704	50554540	Elec.	1 mfd	50V
C705, C706	50554010	Elec.	47 mfd	16V
C707, C708	50554010	Elec.	47 mfd	16V
C709, C710	50548780	Mylar	0.001 mfd	50V
C711, C712	50554780	Elec.	33 mfd	10V
C713, C714	50547420	Dip. Mica	47 pfd	50V
C715, C716	50554540	Elec.	1 mfd	50V
C717, C718	50554540	Elec.	1 mfd	50V
C719, C720	50547450	Dip. Mica	220 pfd	50V
		MISCELLANEOUS		
P701	51221330	Connector, Plug; 9P		
P711	51221270	Connector, Plug; 3P		
W701	51817630	Jumper		

2-9. MOTHER PCB A ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51687030	PCB Assy
	51677030	PCB
		TRANSISTORS
Q801~Q820	51451030	FET, 2SK68AM
		DIODES
D801~D824	51431180	1S2473HJ
D836	51431180	1S2473HJ
D843, D844	51431180	1S2473HJ
		CARBON RESISTORS
		All resistors are rated ±5% tolerance and ¼ watt.
R801~R804	50573220	47 k ohm
R805, R806	50573260	68 k ohm
R809, R810	50572820	1 k ohm
R811~R817	50573300	100 k ohm
		VARIABLE RESISTORS
R807, R808	51500960	Semi-fixed, 100 k ohm - B
		MISCELLANEOUS
	51812090	Jumper, JPW-02 (34 used)

2-10. OSC PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686942	PCB Assy
	51676941	PCB
		TRANSISTORS
Q821~Q825	51450910	2SC945AK
Q826	50425530	2SA733P
Q827	51450910	2SC945AK
Q828	50425530	2SA733P
Q829	51450910	2SA945AK
Q830	51450870	2SD313E
	50425270	2SD288K
Q831, Q832	51450910	2SC945AK
Q833	51450980	2SC1741Q
Q835, Q386	50425490	2SC1636-1
	51450860	2SC1636-2
		DIODES
D825	50425170	1S2473VE
D826	50425540	Zener, RD6.2EB 3%
D827~D836	50425170	1S2473VE
D838	50425540	Zener, RD6.2EB 3%
D839	50425170	1S2473VE
D840~D842	51430890	W03C
		CARBON RESISTORS
		All resistors are rated ±5% tolerance and ¼ watt.
R821	50571160	27 k ohm
R822	50571000	5.6 k ohm
R823	50570940	3.3 k ohm
R824	50571140	22 k ohm
R825	50571000	5.6 k ohm
R826	50570940	3.3 k ohm
R827	50570580	100 ohm
R828	50571160	27 k ohm
R829	50570580	100 ohm
R830	50570940	3.3 k ohm
R831	50571160	27 k ohm
R832	50571000	5.6 k ohm
R833	50570940	3.3 k ohm
R834	50570820	1 k ohm
R835	50571140	22 k ohm
R836	50571000	5.6 k ohm
R837	50570900	2.2 k ohm
R838	50571220	47 k ohm
R839	50571140	22 k ohm
R840	50570900	2.2 k ohm
R841	50571160	27 k ohm
R842	50571000	5.6 k ohm
R843	50571020	6.8 k ohm
R844~R846	50570900	2.2 k ohm
R847	50570860	1.5 k ohm
R850	50571060	10 k ohm
R851	50571320	120 k ohm
R853	50571040	8.2 k ohm
R854	50571100	15 k ohm
R855	50571140	22 k ohm
R856	50571040	8.2 k ohm
R857	50570380	15 ohm

REF. NO.	PARTS NO.	DESCRIPTION		
R871, R872	50570680	270 ohm		
R873, R874	50571000	5.6 k ohm		
R875, R876	50571540	1 M ohm		
R877~R879	50570380	15 ohm		
	CAPACITORS			
C801	50549770	Elec.	10 mfd	16V
C802	50549680	Elec.	3.3 mfd	25V
C803	50549660	Elec.	1 mfd	25V
C804	50554630	Elec.	100 mfd	35V
C805	50548020	Mylar	0.01 mfd	50V
C806	50554040	Elec.	10 mfd	25V
C807	50549780	Elec.	22 mfd	16V (KU)
C809, C810	50543510	Dip. Mica	33 pfd	50V
C811, C812	50543440	Dip. Mica	820 pfd	50V
C813, C814	50554390	Elec.	220 mfd	16V
C815, C816	50542300	Ceramic	0.047 mfd	50V
	VARIABLE RESISTORS			
R849	51501530	Semi-fixed, 5 k ohm - B		
R861~R866	50536310	Semi-fixed, 220 k ohm - B		
R867, R868	51501570	Semi-fixed, 100 k ohm - B		
R869, R870	51501560	Semi-fixed, 50 k ohm - B		
	RELAYS			
K801~K803	50611370	LAB2L, DC12V		
	COILS			
L801, L802	51600440	Trap, 3 mH		
	MISCELLANEOUS			
U801	50400950	Bias Oscillator Unit, 100 kHz		
U802	50400850	P.P.M. Drive Unit		
J801	51223790	Connector, 8P		
J802	51223820	Connector, 11P		
P881	51221460	Connector, 3P		
P882	51221490	Connector, 6P (WHT)		
P883	51222060	Connector, 6P (BLK)		
	55531320	Heat Sink		
	51817630	Jumper (5 used)		
TP1~TP6	57240420	Pin, F3 Type		
	55532480	Shield Paper, B		
	55345830	Push Rivet, Small (2 used)		
	55341180	Push Rivet, Large (1 used)		
		Washer, LWI ϕ4		
		Washer, Fiber; ϕ3.5 x ϕ8 x t0.5		

2-11. OUTPUT VR PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686971	PCB Assy
	51676970	PCB
R891, R892	51502240	Var. Res., 20 k ohm - A x 2
R893	51831160	Resistor, Carbon; 27 k ohm ¼W 5%
R894	51831060	Resistor, Carbon; 10 k ohm ¼W 5%
R896	51501570	Var. Res., Semi-fixed; 100 k ohm - B

2-12. POWER SUPPLY PCB ASSY

REF. NO.	PARTS NO.	DESCRIPTION
	51686951	PCB Assy
	51676950	PCB
	TRANSISTORS	
Q901	51450870	2SD317E
Q902, Q903	51450910	2SC945AK
Q904	51450870	2SD317E
Q905, Q906	51450910	2SC945AK
Q907	51450870	2SD317E
Q908, Q909	51450910	2SC945AK
Q910	51450870	2SD317E
Q911, Q912	51450910	2SC945AK
Q913, Q914	50425530	2SA733P
Q915	50425370	2SA634L
Q916	51450380	2SA750E
	DIODES	
D901~D905	51430890	W03C
D906	50425540	Zener, RD6.2EB 3%
D907	51430890	W03C
D908	50425540	Zener, RD6.2EB 3%
D909~D912	51430170	U05E
D913	51430890	W03C
D914	50425540	Zener, RD6.2EB 3%
D915~D918	51430890	W03C
D919	50425540	Zener, RD6.2EB 3%
D920	50425170	1S2473VE
D921	51430890	W03C
D922, D923	50425170	1S2473VE
	RESISTORS **All resistors are rated ±5% tolerance, ¼ watt and of carbon type unless otherwise noted.**	
R901	50570900	2.2 k ohm
R902	50570980	4.7 k ohm
R903	50570900	2.2 k ohm
R904, R905	50571020	6.8 k ohm
R906	50570820	1 k ohm
R907	50570900	2.2 k ohm
R908	50570980	4.7 k ohm
R909	50570900	2.2 k ohm
R910, R911	50571020	6.8 k ohm

REF. NO.	PARTS NO.	DESCRIPTION
R912	50570820	1 k ohm
R913	50520580	Cement, 1.5 ohm 5W
R914	50570740	470 ohm
R915	50570900	2.2 k ohm
R916	50570580	100 ohm
R917	50570900	2.2 k ohm
R918	50570920	2.7 k ohm
R919	50571000	5.6 k ohm
R920	50570780	680 ohm
R921	51803000	5.6 k ohm ½W
R922	50570900	2.2 k ohm
R923	50570980	4.7 k ohm
R924	50570580	100 ohm
R925	50570900	2.2 k ohm
R926	50570820	1 k ohm
R927	50571020	6.8 k ohm
R928	50570980	4.7 k ohm
R930	50571060	10 k ohm
R931	50570900	2.2 k ohm
R932	50570980	4.7 k ohm
R933	50570580	100 ohm
R934	50570900	2.2 k ohm
R935	50571460	470 k ohm
R936	50571060	10 k ohm
R937	51818280	15 ohm Non Flammable
R938	50571060	10 k ohm
R939	50571040	8.2 k ohm
R940, R941	50571300	100 k ohm
R942		100 ohm

CAPACITORS

C901	50555580	Elec.	1000 mfd	25V
C902	50554170	Elec.	100 mfd	25V
C903	50548020	Mylar	0.01 mfd	50V 10%
C904	50554200	Elec.	100 mfd	16V
C905	50555580	Elec.	1000 mfd	25V

REF. NO.	PARTS NO.	DESCRIPTION		
C906	50554170	Elec.	100 mfd	25V
C907	50548020	Mylar	0.01 mfd	50V
C908	50554200	Elec.	100 mfd	16V
C909, C910	50555850	Elec.	1000 mfd	50V
C911	50555840	Elec.	470 mfd	50V
C912	50557140	Elec.	2200 mfd	25V
C913	50554170	Elec.	100 mfd	25V
C914	50554540	Elec.	1 mfd	50V
C915	50554200	Elec.	100 mfd	16V
C916	50555580	Elec.	1000 mfd	25V
C917	50554170	Elec.	100 mfd	25V
C918	50554540	Elec.	1 mfd	50V
C919	50554200	Elec.	100 mfd	16V
C920	50548020	Mylar	0.01 mfd	50V 10%
C921	50555580	Elec.	1000 mfd	25V
C922	50554170	Elec.	100 mfd	25V
C923	50554540	Elec.	1 mfd	50V
C924	50554200	Elec.	100 mfd	16V
C925	50548020	Mylar	0.01 mfd	50V 10%
C926, C927	50554910	Elec.	220 mfd	10V
C928	50554540	Elec.	1 mfd	50V
C929	50554720	Elec.	22 mfd	10V

VARIABLE RESISTOR

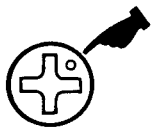
R929	51501520	Semi-fixed, 2 k ohm - B

MISCELLANEOUS

P901	51221380	Connector, Plug; 14P
P902	51223240	Connector, Plug; 9P
	51817130	Jumper (6 used)
	50332950	Tube, Insulating
	50332910	Sheet, Insulating

ASSEMBLING HARDWARE CODING LIST

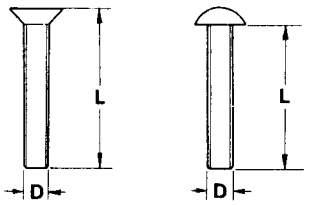
All screws conform to ISO standards, and have crossrecessed heads, unless otherwise noted.
ISO screws have the head inscribed with a point as in the figure to the right.



FOR EXAMPLE:

B M 3 x 6

- B — Nomenclature
- M — Metric System
- 3 — Diameter in mm (D) *
- 6 — Length in mm (L)



* Inner dia. for washers and nuts

	Code	Name	Type
MACHINE SCREW	R	Round Head Screw	
	P	Pan Head Screw	
	T	Stove Head Screw (Truss)	
	B	Binding Head Screw	
	F	Flat Countersunk Head Screw	
	O	Oval Countersunk Head Screw	
WOOD SCREW	RW	Round Head Wood Screw	
	FW	Flat Countersunk Wood Screw	
	OW	Oval Countersunk Wood Screw	
SEMS SCREW	BSA	Binding Head SEMS Screw(A Type)	
	BSB	Binding Head SEMS Screw(B Type)	
	BSF	Binding Head SEMS Screw(F Type)	
	PSA	Pan Head SEMS Screw(A Type)	
	PSB	Pan Head SEMS Screw(B Type)	

	Code	Name	Type
TAPPING SCREW	BTA	Binding Head Tapping Screw(A Type)	
	BTB	Binding Head Tapping Screw(B Type)	
	RTA	Round Head Tapping Screw(A Type)	
	RTB	Round Head Tapping Screw(B Type)	
SETSCREW	SF	Hex Socket Setscrew(Flat Point)	
	SC	Hex Socket Setscrew(Cup Point)	
	SS	Slotted Socket Setscrew(Flat Point)	
WASHER	E	E-Ring (Retaining Washer)	
	W	Flat Washer (Plain)	
	SW	Lock Washer (Spring)	
	LWI	Lock Washer (Internal Teeth)	
	LWE	Lock Washer (External Teeth)	
	TW	Trim Washer (Countersunk)	
NUT	N	Hex Nut	

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